

**IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
TYLER DIVISION**

REALTIME DATA LLC d/b/a IXO,
Plaintiff,
v.
ECHOSTAR CORPORATION,
ECHOSTAR TECHNOLOGIES L.L.C.,
HUGHES NETWORK SYSTEMS, LLC,
DISH NETWORK CORPORATION,
DISH NETWORK L.L.C., SLING TV
L.L.C., SLING MEDIA, L.L.C., AND
ARRIS GROUP, INC.,
Defendants.

Case No. 6:17-cv-00084

JURY TRIAL DEMANDED

AMENDED COMPLAINT FOR PATENT INFRINGEMENT

This is an action for patent infringement arising under the Patent Laws of the United States of America, 35 U.S.C. § 1 *et seq.* in which Plaintiff Realtime Data LLC d/b/a IXO (“Plaintiff,” “Realtime,” or “IXO”) makes the following allegations against Defendants EchoStar Corporation, EchoStar Technologies, L.L.C., Hughes Network Systems, LLC, DISH Network Corporation, DISH Network L.L.C., Sling TV L.L.C., Sling Media, L.L.C., and Arris Group, Inc.:

PARTIES

1. Realtime is a New York limited liability company. Realtime has places of business at 1828 E.S.E. Loop 323, Tyler, Texas 75701 and 66 Palmer Avenue, Suite 27, Bronxville, NY 10708. Since the 1990s, Realtime has researched and developed specific solutions for data compression, including, for example, those that increase the speeds at which data can be stored and accessed. As recognition of its innovations rooted in this

technological field, Realtime holds over 47 United States patents and has numerous pending patent applications. Realtime has licensed patents in this portfolio to many of the world's leading technology companies. The patents-in-suit relate to Realtime's development of advanced systems and methods for fast and efficient data compression using numerous innovative compression techniques based on, for example, particular attributes of the data.

2. On information and belief, EchoStar Corporation is a Nevada corporation with its principal place of business at 100 Inverness Terrace East, Englewood, CO 80112 and a regular and established place of business at 10303 E Bankhead Hwy # 100, Aledo, TX 76008. See, e.g., <https://www.yellowpages.com/aledo-tx/mip/echostar-satellite-11408900>. Upon information and belief, EchoStar Corporation has a regular and established place of business in this District. On information and belief, EchoStar Corporation can be served through its registered agent, Corporation Service Company, 1560 Broadway, Suite 2090, Denver, CO 80202. On information and belief, EchoStar Corporation directly or indirectly owns co-defendant Hughes Network Systems, LLC ("Hughes").¹

3. On information and belief, EchoStar Technologies, L.L.C. is a Texas limited liability company with its principal place of business at 11717 Exploration Lane, Germantown, MD 20876 and a regular and established place of business at 10303 E Bankhead Hwy # 100, Aledo, TX 76008. See, e.g., <https://www.yellowpages.com/aledo-tx/mip/echostar-satellite-11408900>. Upon information and belief, EchoStar Technologies, L.L.C. has a regular and established place of business in this District. On information and belief, EchoStar Technologies, L.L.C. can be served through its registered agent, Corporation Service Company D/B/A CSC-Lawyers Inc., 211 E. 7th Street Suite 620, Austin, TX 78701. EchoStar Corporation and EchoStar Technologies, L.L.C. are

¹ See <http://www.wsj.com/articles/SB10001424052748703584804576143833056404482>

hereinafter referred to as “EchoStar”.

4. On information and belief, Hughes Network Systems, LLC (“Hughes”) is a Delaware limited liability company having a principal place of business at 11717 Exploration Lane, Germantown, MD 20876 and regular and established places of business at 16535 Southwest Fwy, Sugar Land, TX 77479, 11415 Fm 730 N, Azle, TX 76020, and 1500 Harvey Rd, College Station, TX 77840. See, e.g., <https://www.yellowpages.com/sugar-land-tx/mip/hughes-network-sys-453634557>, <https://www.yellowpages.com/azle-tx/mip/hughes-network-system-468970694>, <https://www.mapquest.com/us/texas/business-college-station/hughes-network-systems-llc-275648921>. Upon information and belief, Hughes has a regular and established place of business in this District. See, e.g., <http://hughesnetplans.com/satellite-internet/Texas/P/Plano/> (“HughesNet Satellite Internet Plano: Making Military Technology Available to Civilians By providing such a trustworthy and protected connection, HughesNet has been named America’s #1 choice for satellite Internet. Call to order HughesNet for your Plano home today to get an Internet connection that is tried and tested, whatever your needs are.”). On information and belief, Hughes can be served through its registered agent, Corporation Service Company d/b/a CSC-Lawyers Incorporating Service, 211 E. 7th Street Suite 620, Austin, TX 78701. On information and belief, Hughes has been a direct or indirect subsidiary of EchoStar since at least 2011.

5. On information and belief, Defendant DISH Network Corporation is a Nevada corporation with its principal office at 9601 S. Meridian Blvd., Englewood, CO 80112 and a regular and established place of business at 1211 Broad St, Wichita Falls, TX 76301. See, e.g., <https://www.mapquest.com/us/texas/business-wichita-falls/dish-tv-9269051>. Upon information and belief, DISH Network Corporation has a regular and established place of business in this District. See, e.g., <https://www.dish.com/availability/tx/beaumont> (“Get Dish TV Programming in Beaumont, Texas”). On information and belief, Defendant DISH Network Corporation

conducts business throughout the United States, including in this District. On information and belief, DISH Network Corporation can be served through its registered agent, R. Dodge Stanton, 9601 S. Meridian Blvd., Englewood, CO 80112.

6. On information and belief, Defendant DISH Network L.L.C. is a Colorado limited liability company with its principal office at 9601 S. Meridian Blvd., Englewood, CO 80112 and a regular and established place of business at 1211 Broad St, Wichita Falls, TX 76301. See, e.g., <https://www.mapquest.com/us/texas/business-wichita-falls/dish-tv-9269051>. Upon information and belief, DISH Network L.L.C. has a regular and established place of business in this District. See, e.g., <https://www.dish.com/availability/tx/beaumont> (“Get Dish TV Programming in Beaumont, Texas”). On information and belief, Defendant DISH Network L.L.C. conducts business throughout the United States, including in this District. On information and belief, DISH Network Corporation can be served through its registered agent, R. Dodge Stanton, 9601 S. Meridian Blvd., Englewood, CO 80112. DISH Network Corporation and DISH Network L.L.C. are hereinafter referred to collectively as “DISH” or “Dish”.

7. On information and belief, Defendant Sling TV L.L.C. (“Sling TV”) is a Colorado limited liability company with its principal office at 9601 S. Meridian Blvd., Englewood, CO 80112. On information and belief, Defendant Sling TV has a regular and established place of business in this District and conducts business throughout the United States, including in this District. On information and belief, Sling TV can be served through its registered agent, R. Dodge Stanton, 9601 S. Meridian Blvd., Englewood, CO 80112.

8. On information and belief, Defendant Sling Media L.L.C. (“Sling Media”) is a Delaware limited liability company with its principal office at 1051 E. Hillsdale Blvd, Suite 500, Foster City, CA 94404. On information and belief, Defendant Sling Media has a regular and established place of business in this District and conducts business

throughout the United States, including in this District. On information and belief, Sling Media can be served through its registered agent, The Corporation Trust Company, Corporation Trust Center, 1209 Orange St., Wilmington, DE 19801.

9. On information and belief, Defendant Arris Group, Inc. (“Arris”) is a Delaware corporation with its principal office at 3871 Lakefield Drive, Suwanee, GA, 30024. On information and belief, Arris maintains a regular and established place of business in this District, for example, at 101 E Park Blvd, Plano, TX 75074. See, e.g., <http://www.buzzfile.com/business/Arris-Group,-Inc.-972-546-1700>. On information and belief, Arris maintains a regular and established place of business at 4516 Seton Center Pkwy, Suite 185, Austin, TX 78759. See, e.g., <http://www.arris.com/company/offices/>. On information and belief, Defendant Arris conducts business throughout the United States, including in this District. On information and belief, Arris can be served through its registered agent, Corporation Service Company, 40 Technology Pkwy South, #300, Norcross, GA 30092.

10. On information and belief, EchoStar, as the direct or indirect owner of Hughes, promotes and offers for sales Hughes-branded products, including HN/HX broadband satellite routers. *See, e.g.,* <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en>. As further explained below, HN/HX broadband satellite routers infringe certain asserted patents. Accordingly, each of the Defendants is properly joined in this action pursuant to 35 U.S.C. § 299.

11. On information and belief, EchoStar, as the direct or indirect owner of DISH, Sling TV, and Sling Media promotes and offers for sale DISH and Sling-branded products and services which infringe certain asserted patents. Accordingly, each of the Defendants is properly joined in this action pursuant to 35 U.S.C. § 299.

12. On information and belief, Arris sells and offers for sale products and services incorporating technology from Sling Media which infringes certain asserted

patents. Accordingly, Arris is properly joined in this action pursuant to 35 U.S.C. § 299.

JURISDICTION AND VENUE

13. This action arises under the patent laws of the United States, Title 35 of the United States Code. This Court has original subject matter jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1338(a).

14. This Court has personal jurisdiction over EchoStar Corporation in this action because EchoStar Corporation has committed acts within the Eastern District of Texas giving rise to this action and has established minimum contacts with this forum such that the exercise of jurisdiction over EchoStar Corporation would not offend traditional notions of fair play and substantial justice. EchoStar Corporation directly and through subsidiaries (including Hughes) or intermediaries (including distributors, retailers, and others), has committed and continues to commit acts of infringement in this District by, among other things, offering to sell and selling products and/or services that infringe the asserted patents. Furthermore, upon information and belief, EchoStar Corporation has a regular and established place of business at 10303 E Bankhead Hwy # 100, Aledo, TX 76008. See, e.g., <https://www.yellowpages.com/aledo-tx/mip/echostar-satellite-11408900>. Upon information and belief, EchoStar Corporation has a regular and established place of business in this District.

15. This Court has personal jurisdiction over EchoStar Technologies L.L.C. in this action because EchoStar Technologies L.L.C. has committed acts within the Eastern District of Texas giving rise to this action and has established minimum contacts with this forum such that the exercise of jurisdiction over EchoStar Technologies L.L.C. would not offend traditional notions of fair play and substantial justice. EchoStar Technologies L.L.C. directly and through subsidiaries (including Hughes) or intermediaries (including distributors, retailers, and others), has committed and continues to commit acts of infringement in this District by, among other things, offering to sell and selling products and/or services that infringe the asserted patents. In addition, EchoStar Technologies

L.L.C. is incorporated under the laws of the state of Texas. Furthermore, upon information and belief, EchoStar Technologies L.L.C. has a regular and established place of business at 10303 E Bankhead Hwy # 100, Aledo, TX 76008. See, e.g., <https://www.yellowpages.com/aledo-tx/mip/echostar-satellite-11408900>. Upon information and belief, EchoStar Technologies L.L.C. has a regular and established place of business in this District.

16. This Court has personal jurisdiction over Hughes in this action because Defendants have committed acts within the Eastern District of Texas giving rise to this action and has established minimum contacts with this forum such that the exercise of jurisdiction over Hughes would not offend traditional notions of fair play and substantial justice. Hughes, directly and through subsidiaries or intermediaries (including distributors, retailers, and others), has committed and continues to commit acts of infringement in this District by, among other things, offering to sell and selling products and/or services that infringe the asserted patents. For example, Hughes advertises its services in this District, “HughesNet Satellite Internet Plano: Making Military Technology Available to Civilians By providing such a trustworthy and protected connection, HughesNet has been named America’s #1 choice for satellite Internet. Call to order HughesNet for your Plano home today to get an Internet connection that is tried and tested, whatever your needs are.” See, e.g., <http://hughesnetplans.com/satellite-internet/Texas/P/Plano/>. Hughes is registered to do business in the State of Texas and has appointed Corporation Service Company d/b/a CSC-Lawyers Incorporating Service, 211 E. 7th Street Suite 620, Austin, TX 78701 as its agent for service of process. Furthermore, Hughes has regular and established places of business at 16535 Southwest Fwy, Sugar Land, TX 77479, 11415 Fm 730 N, Azle, TX 76020, and 1500 Harvey Rd, College Station, TX 77840. See, e.g., <https://www.yellowpages.com/sugar-land-tx/mip/hughes-network-sys-453634557>, <https://www.yellowpages.com/azle-tx/mip/hughes-network-system-468970694>, <https://www.mapquest.com/us/texas/business-college-station/hughes-network-systems->

llc-275648921. Upon information and belief, Hughes has a regular and established place of business in this District. See, e.g., <http://hughesnetplans.com/satellite-internet/Texas/P/Plano/> (“HughesNet Satellite Internet Plano: Making Military Technology Available to Civilians By providing such a trustworthy and protected connection, HughesNet has been named America’s #1 choice for satellite Internet. Call to order HughesNet for your Plano home today to get an Internet connection that is tried and tested, whatever your needs are.”).

17. This Court has personal jurisdiction over DISH Network Corporation in this action because DISH Network Corporation has committed acts within the Eastern District of Texas giving rise to this action and has established minimum contacts with this forum such that the exercise of jurisdiction over DISH Network Corporation would not offend traditional notions of fair play and substantial justice. DISH Network Corporation directly and/or through subsidiaries (including one or more of the named Co-Defendants) or intermediaries (including distributors, retailers, and others), has committed and continues to commit acts of infringement in this District by, among other things, offering to sell and selling products and/or services that infringe the asserted patents. For example, DISH Network Corporation advertises, “Get Dish TV Programming in Beaumont, Texas”. See, e.g., <https://www.dish.com/availability/tx/beaumont>. Upon information and belief, DISH has a regular and established place of business at 1211 Broad St, Wichita Falls, TX 76301. See, e.g., <https://www.mapquest.com/us/texas/business-wichita-falls/dish-tv-9269051>. Upon information and belief, DISH Network Corporation has a regular and established place of business in this District. See, e.g., <https://www.dish.com/availability/tx/beaumont> (“Get Dish TV Programming in Beaumont, Texas”).

18. This Court has personal jurisdiction over DISH Network L.L.C. in this action because DISH Network L.L.C. has committed acts within the Eastern District of Texas giving rise to this action and has established minimum contacts with this forum

such that the exercise of jurisdiction over DISH Network L.L.C. would not offend traditional notions of fair play and substantial justice. DISH Network L.L.C. directly and/or through subsidiaries (including one or more of the named Co-Defendants) or intermediaries (including distributors, retailers, and others), has committed and continues to commit acts of infringement in this District by, among other things, offering to sell and selling products and/or services that infringe the asserted patents. For example, DISH Network L.L.C. advertises, “Get Dish TV Programming in Beaumont, Texas”. See, e.g., <https://www.dish.com/availability/tx/beaumont>. Upon information and belief, DISH has a regular and established place of business at 1211 Broad St, Wichita Falls, TX 76301. See, e.g., <https://www.mapquest.com/us/texas/business-wichita-falls/dish-tv-9269051>. Upon information and belief, DISH Network L.L.C. has a regular and established place of business in this District. See, e.g., <https://www.dish.com/availability/tx/beaumont> (“Get Dish TV Programming in Beaumont, Texas”).

19. This Court has personal jurisdiction over Sling TV L.L.C. in this action because Sling TV L.L.C. has committed acts within the Eastern District of Texas giving rise to this action and has established minimum contacts with this forum such that the exercise of jurisdiction over Sling TV L.L.C. would not offend traditional notions of fair play and substantial justice. Sling TV L.L.C. directly and/or through subsidiaries (including one or more of the named Co-Defendants) or intermediaries (including distributors, retailers, and others), has committed and continues to commit acts of infringement in this District by, among other things, offering to sell and selling products and/or services that infringe the asserted patents. On information and belief, Defendant Sling TV has a regular and established place of business in this District.

20. This Court has personal jurisdiction over Sling Media L.L.C. in this action because Sling Media L.L.C. has committed acts within the Eastern District of Texas giving rise to this action and has established minimum contacts with this forum such that the exercise of jurisdiction over Sling Media L.L.C. would not offend traditional notions

of fair play and substantial justice. Sling Media L.L.C. directly and/or through subsidiaries (including one or more of the named Co-Defendants) or intermediaries (including distributors, retailers, and others), has committed and continues to commit acts of infringement in this District by, among other things, offering to sell and selling products and/or services that infringe the asserted patents. On information and belief, Defendant Sling Media has a regular and established place of business in this District.

21. This Court has personal jurisdiction over Arris Group, Inc. in this action because Arris Group, Inc. has committed acts within the Eastern District of Texas giving rise to this action and has established minimum contacts with this forum such that the exercise of jurisdiction over Arris Group, Inc. would not offend traditional notions of fair play and substantial justice. Arris Group, Inc. directly and/or through subsidiaries (including one or more of the named Co-Defendants) or intermediaries (including distributors, retailers, and others), has committed and continues to commit acts of infringement in this District by, among other things, offering to sell and selling products and/or services that infringe the asserted patents. On information and belief, Arris maintains a regular and established place of business in this District, for example, at 101 E Park Blvd, Plano, TX 75074. See, e.g., <http://www.buzzfile.com/business/Arris-Group,-Inc.-972-546-1700>. On information and belief, Arris also maintains a regular and established place of business at 4516 Seton Center Pkwy, Suite 185, Austin, TX 78759. See, e.g., <http://www.arris.com/company/offices/>.

22. Venue is proper in this district under 28 U.S.C. §§ 1391(b), 1391(c) and 1400(b). Defendant Echostar Technologies L.L.C. is incorporated in Texas. Upon information and belief, all Defendants have transacted business in the Eastern District of Texas and have committed acts of direct and indirect infringement in the Eastern District of Texas. In addition, Echostar maintains an Uplink & Broadcast Center in Texas located at 710 Conrads Ln., New Braunfels, TX 78130. See <http://www.echostar.com/company/locations.aspx>. In addition, on information and belief,

EchoStar has a regular and established place of business at 10303 E Bankhead Hwy # 100, Aledo, TX 76008. See, e.g., <https://www.yellowpages.com/aledo-tx/mip/echostar-satellite-11408900>. In addition, Hughes is registered to do business in Texas and maintains a sales office in Texas located at 320 Decker, Suite 100, Irving TX 75062. *See id.* Upon information and belief, Hughes also has a regular and established place of business in this District. See, e.g., <http://hughesnetplans.com/satellite-internet/Texas/P/Plano/> (“HughesNet Satellite Internet Plano: Making Military Technology Available to Civilians By providing such a trustworthy and protected connection, HughesNet has been named America’s #1 choice for satellite Internet. Call to order HughesNet for your Plano home today to get an Internet connection that is tried and tested, whatever your needs are.”). On information and belief, DISH, Sling TV, and Sling Media have regular and established places of business in this District. For example, DISH Network Corporation and/or DISH Network L.L.C. advertises, “Get Dish TV Programming in Beaumont, Texas”. See, e.g., <https://www.dish.com/availability/tx/beaumont>. On information and belief, Arris maintains a place of business in this District at 101 E Park Blvd, Plano, TX 75074. See, e.g., <http://www.buzzfile.com/business/Arris-Group,-Inc.-972-546-1700>. On information and belief, Arris also maintains a regular and established place of business at 4516 Seton Center Pkwy, Suite 185, Austin, TX 78759. See, e.g., <http://www.arris.com/company/offices/>.

ASSERTED PATENTS

23. The asserted patents are U.S. Patent Nos. 8,717,204 (“‘204 patent”); 9,054,728 (“‘728 patent”); 7,358,867 (“‘867 patent”); 8,502,707 (“‘707 patent”), 8,275,897 (“the ‘897 patent”), 8,867,610 (“the ‘610 Patent”), 8,934,535 (“the ‘535 patent”), and 8,553,759 (“the ‘759 patent”) (collectively, “Asserted Patents”).

24. The Asserted Patents have been cited as prior art during the prosecution of at least 400 patent applications of Realtime and other companies. Those other companies

include well-known technology companies such as: Quantum, Fujitsu, IBM, Seagate, STMicroelectronics, Cisco, LSI, Skyfire Labs, Chicago Mercantile Exchange, Thomson Reuters, OSR Open Systems Resources, Exegy, RIM, Renesas, Red Hat, Xerox, and Microsoft.

COUNT I

INFRINGEMENT OF U.S. PATENT NO. 8,717,204

25. Plaintiff realleges and incorporates by reference paragraphs 1-24 above, as if fully set forth herein.

26. Plaintiff Realtime is the owner by assignment of United States Patent No. 8,717,204 entitled “Methods for encoding and decoding data.” The ‘204 patent was duly and legally issued by the United States Patent and Trademark Office on May 6, 2014. A true and correct copy of the ‘204 Patent is included as Exhibit A.

Accused Instrumentality Including HN/HX Systems

27. On information and belief, Defendants EchoStar Corporation, EchoStar Technologies L.L.C., and Hughes Network Systems LLC (collectively, “Defendants”) have offered for sale, sold and/or imported into the United States products that infringe the ‘204 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Defendants’ products and services, such as HN/HX Systems, and all versions and variations thereof since the issuance of the ‘204 patent (“Accused Instrumentality”).

28. On information and belief, Defendants have directly infringed and continue to infringe the ‘204 patent, for example, through their own use and testing of the accused products to practice compression methods claimed by the ‘204 patent, including a method for processing data, the data residing in data fields, comprising: recognizing any characteristic, attribute, or parameter of the data; selecting an encoder associated with the recognized characteristic, attribute, or parameter of the data; compressing the data with the selected encoder utilizing at least one state machine to provide compressed data

having a compression ratio of over 4:1; and point-to-point transmitting the compressed data to a client; wherein the compressing and the transmitting occur over a period of time which is less than a time to transmit the data in an uncompressed form. On information and belief, Defendants use the Accused Instrumentality in its ordinary and customary fashion for their own internal non-testing business purposes, while testing the Accused Instrumentality, and while providing technical support and repair services for the Accused Instrumentality to Defendants' customers, and use of the Accused Instrumentality in its ordinary and customary fashion results in infringement of the methods claimed by the '204 patent.

29. On information and belief, Defendants have had knowledge of the '204 patent since at least the filing of the February 14, 2017 original Complaint in this action or shortly thereafter, and on information and belief, Defendants knew of the '204 patent and knew of their infringement, including by way of this lawsuit.

30. Defendants' affirmative acts of making, using, selling, offering for sale, and/or importing the Accused Instrumentality have induced since the filing of the original Complaint on February 14, 2017 and continue to induce users of the Accused Instrumentality to use the Accused Instrumentality in its normal and customary way to infringe the '204 patent by practicing compression methods claimed by the '204 patent, including a method for processing data, the data residing in data fields, comprising: recognizing any characteristic, attribute, or parameter of the data; selecting an encoder associated with the recognized characteristic, attribute, or parameter of the data; compressing the data with the selected encoder utilizing at least one state machine to provide compressed data having a compression ratio of over 4:1; and point-to-point transmitting the compressed data to a client; wherein the compressing and the transmitting occur over a period of time which is less than a time to transmit the data in an uncompressed form. For example, Defendants explain to customers the benefits of using the Accused Instrumentality, "A standard TCP/IP header is 40 bytes per packet,

and most of that information is redundant for a given session. Header compression suppresses any redundant information, reducing the bandwidth required for the header. ... PEP packet payload compression uses the V.44 lossless compression algorithm. ... Stateful compression is able to take advantage of redundancy in all messages being sent instead of only redundancy within a message, thus providing significantly better compression ratios. Compression ratios of up to 12:1 are achieved.” See <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 9. Defendants specifically intended and were aware that the normal and customary use of the Accused Instrumentality would infringe the ‘204 patent. Defendants performed the acts that constitute induced infringement, and would induce actual infringement, with the knowledge of the ‘204 patent and with the knowledge, or willful blindness to the probability, that the induced acts would constitute infringement. On information and belief, Defendants engaged in such inducement to promote the sales of the Accused Instrumentality, *e.g.*, through Defendants’ user manuals, product support, marketing materials, and training materials to actively induce the users of the Accused Instrumentality to infringe the ‘204 patent. Accordingly, Defendants have induced since the filing of the original Complaint on February 14, 2017 and continue to induce users of the Accused Instrumentality to use the Accused Instrumentality in its ordinary and customary way to infringe the ‘204 patent, knowing that such use constitutes infringement of the ‘204 patent.

31. The Accused Instrumentality practices a method for processing data, the data residing in data fields. See, *e.g.*, <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 8-9 (“HN/HX Systems provide IP/TCP/UDP/RTP header compression and payload compression in both inbound and outbound directions. A standard TCP/IP header is 40 bytes per packet, and most of that information is redundant for a given session. ... PEP packet payload compression uses the V.44 lossless compression algorithm.”).

32. The Accused Instrumentality recognizes any characteristic, attribute, or parameter of the data, for example, whether the data is packet header data or packet payload data. See, e.g., <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 8-9 (“HN/HX Systems provide IP/TCP/UDP/RTP header compression and payload compression in both inbound and outbound directions. A standard TCP/IP header is 40 bytes per packet, and most of that information is redundant for a given session. Header compression suppresses any redundant information, reducing the bandwidth required for the header. This compression capability requires that a large number of the fields either do not change or change only in expected ways. Inbound header compression compresses TCP/IP headers from 40 bytes to 10–12 bytes, reducing typical bandwidth usage by 15–20%. The inbound compression algorithm is a Hughes-extended version of RFC 1144. Multiple types of IP headers can be compressed, including IP headers, UDP headers, TCP headers, RTP headers, and Hughes’ PBP headers. Outbound header compression compresses IP, UDP, and RTP headers using the header fields that do not change or change in predictable ways. The outbound compression algorithm is based on RFC 3095, Robust Header Compression, and the Hughes inbound header compression algorithm. IP/UDP/RTP headers for RTP packets (types G.729 and G.723.1) are compressed. With outbound header compression, the size of the IP/UDP/RTP headers becomes 5 bytes from 40 bytes. With an average RTP payload size of 20 bytes, the expected compression ratio for IP/UDP/RTP packets is $35/(40+20) = 58.3\%$. PEP packet payload compression uses the V.44 lossless compression algorithm. V.44 is an ITU standardized compression technology based on a Hughes-patented compression algorithm. The PEP stateful compression implementation takes advantage of the guaranteed, in-order delivery service provided by the PEP backbone protocol. Stateful compression is able to take advantage of redundancy in all messages being sent instead of only redundancy within a message, thus providing significantly better compression ratios. Compression ratios of up to 12:1 are

achieved. HN/HX Systems feature IP Payload Compression for UDP Packets utilizing the IP Payload Compression Protocol (IPComp) per RFC 3173 to compress UDP traffic (for example, DNS, BRP, SNMP, Multicast traffic) using a lossless, stateless compression algorithm. The bandwidth savings is a function of traffic type. Bandwidth usage for typical DNS request traffic will be reduced by 10%, DNS responses by 30%, and SNMP traffic by 50%.”).

33. The Accused Instrumentality selects an encoder associated with the recognized characteristic, attribute, or parameter of the data, for example, whether the data is packet header data or packet payload data. See, e.g., <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 8-9 (“HN/HX Systems provide IP/TCP/UDP/RTP header compression and payload compression in both inbound and outbound directions. A standard TCP/IP header is 40 bytes per packet, and most of that information is redundant for a given session. Header compression suppresses any redundant information, reducing the bandwidth required for the header. This compression capability requires that a large number of the fields either do not change or change only in expected ways. Inbound header compression compresses TCP/IP headers from 40 bytes to 10–12 bytes, reducing typical bandwidth usage by 15–20%. The inbound compression algorithm is a Hughes-extended version of RFC 1144. Multiple types of IP headers can be compressed, including IP headers, UDP headers, TCP headers, RTP headers, and Hughes’ PBP headers. Outbound header compression compresses IP, UDP, and RTP headers using the header fields that do not change or change in predictable ways. The outbound compression algorithm is based on RFC 3095, Robust Header Compression, and the Hughes inbound header compression algorithm. IP/UDP/RTP headers for RTP packets (types G.729 and G.723.1) are compressed. With outbound header compression, the size of the IP/UDP/RTP headers becomes 5 bytes from 40 bytes. With an average RTP payload size of 20 bytes, the expected compression ratio for

IP/UDP/RTP packets is $35/(40+20) = 58.3\%$. PEP packet payload compression uses the V.44 lossless compression algorithm. V.44 is an ITU standardized compression technology based on a Hughes-patented compression algorithm. The PEP stateful compression implementation takes advantage of the guaranteed, in-order delivery service provided by the PEP backbone protocol. Stateful compression is able to take advantage of redundancy in all messages being sent instead of only redundancy within a message, thus providing significantly better compression ratios. Compression ratios of up to 12:1 are achieved. HN/HX Systems feature IP Payload Compression for UDP Packets utilizing the IP Payload Compression Protocol (IPComp) per RFC 3173 to compress UDP traffic (for example, DNS, BRP, SNMP, Multicast traffic) using a lossless, stateless compression algorithm. The bandwidth savings is a function of traffic type. Bandwidth usage for typical DNS request traffic will be reduced by 10%, DNS responses by 30%, and SNMP traffic by 50%.”).

34. The Accused Instrumentality compresses the data with the selected encoder utilizing at least one state machine to provide compressed data having a compression ratio of over 4:1. See, e.g., <http://www.hughes.com/resources/key-features-of-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 8-9 (“HN/HX Systems provide IP/TCP/UDP/RTP header compression and payload compression in both inbound and outbound directions. A standard TCP/IP header is 40 bytes per packet, and most of that information is redundant for a given session. Header compression suppresses any redundant information, reducing the bandwidth required for the header. This compression capability requires that a large number of the fields either do not change or change only in expected ways. Inbound header compression compresses TCP/IP headers from 40 bytes to 10–12 bytes, reducing typical bandwidth usage by 15–20%. The inbound compression algorithm is a Hughes-extended version of RFC 1144. Multiple types of IP headers can be compressed, including IP headers, UDP headers, TCP headers, RTP headers, and Hughes’ PBP headers. Outbound header compression compresses IP,

UDP, and RTP headers using the header fields that do not change or change in predictable ways. The outbound compression algorithm is based on RFC 3095, Robust Header Compression, and the Hughes inbound header compression algorithm. IP/UDP/RTP headers for RTP packets (types G.729 and G.723.1) are compressed. With outbound header compression, the size of the IP/UDP/RTP headers becomes 5 bytes from 40 bytes. With an average RTP payload size of 20 bytes, the expected compression ratio for IP/UDP/RTP packets is $35/(40+20) = 58.3\%$. PEP packet payload compression uses the V.44 lossless compression algorithm. V.44 is an ITU standardized compression technology based on a Hug hes-patented compression algorithm. The PEP stateful compression implementation takes advantage of the guaranteed, in-order delivery service provided by the PEP backbone protocol. Stateful compression is able to take advantage of redundancy in all messages being sent instead of only redundancy within a message, thus providing significantly better compression ratios. Compression ratios of up to 12:1 are achieved. HN/HX Systems feature IP Payload Compression for UDP Packets utilizing the IP Payload Compression Protocol (IPComp) per RFC 3173 to compress UDP traffic (for example, DNS, BRP, SNMP, Multicast traffic) using a lossless, stateless compression algorithm. The bandwidth savings is a function of traffic type. Bandwidth usage for typical DNS request traffic will be reduced by 10%, DNS responses by 30%, and SNMP traffic by 50%.”).

35. The Accused Instrumentality point-to-point transmits the compressed data to a client. See, e.g., <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 1 (“Fully IP compliant, all HN/HX broadband satellite routers interoperate directly with other routers on the remote LAN through standard IP protocols, eliminating the need for an external router.”).

36. In the Accused Instrumentality, the compressing and the transmitting occur over a period of time which is less than a time to transmit the data in an uncompressed form. See, e.g., <http://www.hughes.com/resources/key-features-of->

<hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 9 (“Inbound header compression compresses TCP/IP headers from 40 bytes to 10–12 bytes, reducing typical bandwidth usage by 15–20%. … With outbound header compression, the size of the IP/UDP/RTP headers becomes 5 bytes from 40 bytes. With an average RTP payload size of 20 bytes, the expected compression ratio for IP/UDP/RTP packets is $35/(40+20) = 58.3\%$. Stateful compression is able to take advantage of redundancy in all messages being sent instead of only redundancy within a message, thus providing significantly better compression ratios. Compression ratios of up to 12:1 are achieved. … The bandwidth savings is a function of traffic type. Bandwidth usage for typical DNS request traffic will be reduced by 10%, DNS responses by 30%, and SNMP traffic by 50%.”).

37. Defendants also infringe other claims of the ‘204 patent, directly and through inducing infringement, for similar reasons as explained above with respect to Claim 1 of the ‘204 patent.

38. By making, using, offering for sale, selling and/or importing into the United States the Accused Instrumentality, and touting the benefits of using the Accused Instrumentality’s compression features, Defendants have injured Realtime and are liable to Realtime for infringement of the ‘204 patent pursuant to 35 U.S.C. § 271.

39. As a result of Defendants’ infringement of the ‘204 patent, Plaintiff Realtime is entitled to monetary damages in an amount adequate to compensate for Defendants’ infringement, but in no event less than a reasonable royalty for the use made of the invention by Defendants, together with interest and costs as fixed by the Court.

COUNT II
INFRINGEMENT OF U.S. PATENT NO. 9,054,728

40. Plaintiff realleges and incorporates by reference paragraphs 1-39 above, as if fully set forth herein.

41. Plaintiff Realtime is the owner by assignment of United States Patent No.

9,054,728 (“the ‘728 patent”) entitled “Data compression systems and methods.” The ‘728 patent was duly and legally issued by the United States Patent and Trademark Office on June 9, 2015. A true and correct copy of the ‘728 Patent is included as Exhibit B.

Accused Instrumentality Including HN/HX Systems

42. On information and belief, Defendants have offered for sale, sold and/or imported into the United States Hughes products that infringe the ‘728 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Defendants’ products and services, such as HN/HX Systems, and all versions and variations thereof since the issuance of the ‘728 patent (“Accused Instrumentality”).

43. On information and belief, Defendants have directly infringed and continue to infringe the ‘728 patent, for example, through their own use and testing of the Accused Instrumentality, which constitute systems for compressing data claimed by Claim 1 of the ‘728 patent, comprising a processor; one or more content dependent data compression encoders; and a single data compression encoder; wherein the processor is configured: to analyze data within a data block to identify one or more parameters or attributes of the data wherein the analyzing of the data within the data block to identify the one or more parameters or attributes of the data excludes analyzing based solely on a descriptor that is indicative of the one or more parameters or attributes of the data within the data block; to perform content dependent data compression with the one or more content dependent data compression encoders if the one or more parameters or attributes of the data are identified; and to perform data compression with the single data compression encoder, if the one or more parameters or attributes of the data are not identified. Upon information and belief, Defendants use the Accused Instrumentality, an infringing system, for their own internal non-testing business purposes, while testing the Accused Instrumentality, and while providing technical support and repair services for the Accused Instrumentality to Defendants’ customers.

44. On information and belief, Defendants have had knowledge of the ‘728 patent since at least the filing of this Complaint or shortly thereafter, and on information and belief, Defendants knew of the ‘728 patent and knew of their infringement, including by way of this lawsuit.

45. Defendants’ affirmative acts of making, using, selling, offering for sale, and/or importing the Accused Instrumentality has induced and continue to induce users of the Accused Instrumentality to use the Accused Instrumentality in its normal and customary way on compatible systems to infringe the ‘728 patent, knowing that when the Accused Instrumentality is used in its ordinary and customary manner with such compatible systems, such systems constitute infringing systems for compressing data comprising; a processor; one or more content dependent data compression encoders; and a single data compression encoder; wherein the processor is configured: to analyze data within a data block to identify one or more parameters or attributes of the data wherein the analyzing of the data within the data block to identify the one or more parameters or attributes of the data excludes analyzing based solely on a descriptor that is indicative of the one or more parameters or attributes of the data within the data block; to perform content dependent data compression with the one or more content dependent data compression encoders if the one or more parameters or attributes of the data are identified; and to perform data compression with the single data compression encoder, if the one or more parameters or attributes of the data are not identified. For example, Defendants explain to customers the benefits of using the Accused Instrumentality, “A standard TCP/IP header is 40 bytes per packet, and most of that information is redundant for a given session. Header compression suppresses any redundant information, reducing the bandwidth required for the header. ... PEP packet payload compression uses the V.44 lossless compression algorithm. ... Stateful compression is able to take advantage of redundancy in all messages being sent instead of only redundancy within a message, thus providing significantly better compression ratios. Compression ratios of up to 12:1 are

achieved.” See <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 9. Defendants specifically intended and were aware that the normal and customary use of the Accused Instrumentality on compatible systems would infringe the ‘728 patent. Defendants performed the acts that constitute induced infringement, and would induce actual infringement, with the knowledge of the ‘728 patent and with the knowledge, or willful blindness to the probability, that the induced acts would constitute infringement. On information and belief, Defendants engaged in such inducement to promote the sales of the Accused Instrumentality, *e.g.*, through Defendants’ user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the ‘728 patent. Accordingly, Defendants have induced since the filing of the original Complaint on February 14, 2017 and continue to induce end users of the accused products to use the accused products in their ordinary and customary way with compatible systems to make and/or use systems infringing the ‘728 patent, knowing that such use of the Accused Instrumentality with compatible systems will result in infringement of the ‘728 patent.

46. Defendants also indirectly infringe the ‘728 patent by manufacturing, using, selling, offering for sale, and/or importing the accused products, with knowledge that the accused products were and are especially manufactured and/or especially adapted for use in infringing the ‘728 patent and are not a staple article or commodity of commerce suitable for substantial non-infringing use. On information and belief, the Accused Instrumentality is designed to function with compatible hardware to create systems for compressing data comprising; a processor; one or more content dependent data compression encoders; and a single data compression encoder; wherein the processor is configured: to analyze data within a data block to identify one or more parameters or attributes of the data wherein the analyzing of the data within the data block to identify the one or more parameters or attributes of the data excludes analyzing

based solely on a descriptor that is indicative of the one or more parameters or attributes of the data within the data block; to perform content dependent data compression with the one or more content dependent data compression encoders if the one or more parameters or attributes of the data are identified; and to perform data compression with the single data compression encoder, if the one or more parameters or attributes of the data are not identified. Because the Accused Instrumentality is designed to operate as the claimed system for compressing input data, the Accused Instrumentality has no substantial non-infringing uses, and any other uses would be unusual, far-fetched, illusory, impractical, occasional, aberrant, or experimental. Defendants' manufacture, use, sale, offering for sale, and/or importation of the Accused Instrumentality constitutes contributory infringement of the '728 patent.

47. The Accused Instrumentality is a system for compressing data, comprising a processor. For example, the Accused Instrumentality must contain a processor.

48. The Accused Instrumentality is a system for compressing data, comprising one or more content dependent data compression encoders. For example, the Accused Instrumentality recognizes packet header data and removes redundancies in such data, which is a content dependent data compression encoder. This results in transmitting fewer bits to represent a data set and decreased use of network bandwidth. See, e.g., <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 9 ("A standard TCP/IP header is 40 bytes per packet, and most of that information is redundant for a given session. Header compression suppresses any redundant information, reducing the bandwidth required for the header. This compression capability requires that a large number of the fields either do not change or change only in expected ways. Inbound header compression compresses TCP/IP headers from 40 bytes to 10–12 bytes, reducing typical bandwidth usage by 15–20%. The inbound compression algorithm is a Hughes-extended version of RFC 1144. Multiple types of IP headers can be compressed, including IP headers, UDP headers, TCP

headers, RTP headers, and Hughes' PBP headers.”).

49. The Accused Instrumentality comprises a single data compression encoder. See, e.g., <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 9 (“PEP packet payload compression uses the V.44 lossless compression algorithm. V.44 is an ITU standardized compression technology based on a Hughes-patented compression algorithm.”).

50. The Accused Instrumentality analyzes data within a data block to identify one or more parameters or attributes of the data, for example, whether any information in the header is redundant. See, e.g., <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 9 (“A standard TCP/IP header is 40 bytes per packet, and most of that information is redundant for a given session. Header compression suppresses any redundant information, reducing the bandwidth required for the header. This compression capability requires that a large number of the fields either do not change or change only in expected ways. Inbound header compression compresses TCP/IP headers from 40 bytes to 10–12 bytes, reducing typical bandwidth usage by 15–20%. The inbound compression algorithm is a Hughes-extended version of RFC 1144. Multiple types of IP headers can be compressed, including IP headers, UDP headers, TCP headers, RTP headers, and Hughes' PBP headers.”).

51. The Accused Instrumentality performs content dependent data compression with the one or more content dependent data compression encoders if the one or more parameters or attributes of the data are identified, for example, whether any information in the header is redundant. See, e.g., <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 9 (“A standard TCP/IP header is 40 bytes per packet, and most of that information is redundant for a given session. Header compression suppresses any redundant information, reducing the bandwidth required for the header. This compression capability requires that a large

number of the fields either do not change or change only in expected ways. Inbound header compression compresses TCP/IP headers from 40 bytes to 10–12 bytes, reducing typical bandwidth usage by 15—20%. The inbound compression algorithm is a Hughes-extended version of RFC 1144. Multiple types of IP headers can be compressed, including IP headers, UDP headers, TCP headers, RTP headers, and Hughes' PBP headers.”).

52. The Accused Instrumentality performs data compression with the single data compression encoder, if the one or more parameters or attributes of the data are not identified. See, e.g., <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 9 (“PEP packet payload compression uses the V.44 lossless compression algorithm. V.44 is an ITU standardized compression technology based on a Hughes-patented compression algorithm.”).

53. Defendants also infringe other claims of the ‘728 patent, directly and through inducing infringement and contributory infringement, for similar reasons as explained above with respect to Claim 1 of the ‘728 patent.

54. By making, using, offering for sale, selling and/or importing into the United States the Accused Instrumentality, and touting the benefits of using the Accused Instrumentality’s compression features, Defendants have injured Realtime and are liable to Realtime for infringement of the ‘728 patent pursuant to 35 U.S.C. § 271.

55. As a result of Defendants’ infringement of the ‘728 patent, Plaintiff Realtime is entitled to monetary damages in an amount adequate to compensate for Defendants’ infringement, but in no event less than a reasonable royalty for the use made of the invention by Defendants, together with interest and costs as fixed by the Court.

COUNT III

INFRINGEMENT OF U.S. PATENT NO. 7,358,867

56. Plaintiff realleges and incorporates by reference paragraphs 1-55 above, as

if fully set forth herein.

57. Plaintiff Realtime is the owner by assignment of United States Patent No. 7,358,867 entitled “Content independent data compression method and system.” The ‘867 patent was duly and legally issued by the United States Patent and Trademark Office on April 15, 2008. A true and correct copy of the ‘867 Patent is included as Exhibit C.

Accused Instrumentality Including HN/HX Systems

58. On information and belief, Defendants have offered for sale, sold and/or imported into the United States Hughes products that infringe the ‘867 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Defendants’ products and services, such as HN/HX Systems, and all versions and variations thereof since the issuance of the ‘867 patent (“Accused Instrumentality”).

59. On information and belief, Defendants have directly infringed and continue to infringe the ‘867 patent, for example, through their own use and testing of the accused products to practice compression methods claimed by the ‘867 patent, including a method comprising: receiving a plurality of data blocks; determining whether or not to compress each one of said plurality of data blocks with a particular one or more of several encoders; if said determination is to compress with said particular one or more of said several encoders for a particular one of said plurality of data blocks; compressing said particular one of said plurality of data blocks with said particular one or more of said several encoders to provide a compressed data block; providing a data compression type descriptor representative of said particular one or more of said several encoders; outputting said data compression type descriptor and said compressed data block; if said determination is to not compress said particular one of said plurality of data blocks; providing a null data compression type descriptor representative of said determination not to compress; and outputting said null data compression type descriptor and said particular one of said plurality of data blocks. On information and belief, Defendants use the

Accused Instrumentality in its ordinary and customary fashion for their own internal non-testing business purposes, while testing the Accused Instrumentality, and while providing technical support and repair services for the Accused Instrumentality to Defendants' customers, and use of the Accused Instrumentality in its ordinary and customary fashion results in infringement of the methods claimed by the '867 patent.

60. On information and belief, Defendants have had knowledge of the '867 patent since at least the filing of this Complaint or shortly thereafter, and on information and belief, Defendants knew of the '867 patent and knew of their infringement, including by way of this lawsuit.

61. Defendants' affirmative acts of making, using, selling, offering for sale, and/or importing the Accused Instrumentality have induced since the filing of the original Complaint on February 14, 2017 and continue to induce users of the Accused Instrumentality to use the Accused Instrumentality in its normal and customary way to infringe the '867 patent by practicing compression methods claimed by the '867 patent, including a method comprising: receiving a plurality of data blocks; determining whether or not to compress each one of said plurality of data blocks with a particular one or more of several encoders; if said determination is to compress with said particular one or more of said several encoders for a particular one of said plurality of data blocks; compressing said particular one of said plurality of data blocks with said particular one or more of said several encoders to provide a compressed data block; providing a data compression type descriptor representative of said particular one or more of said several encoders; outputting said data compression type descriptor and said compressed data block; if said determination is to not compress said particular one of said plurality of data blocks; providing a null data compression type descriptor representative of said determination not to compress; and outputting said null data compression type descriptor and said particular one of said plurality of data blocks. For example, Defendants explain to customers the benefits of using the Accused Instrumentality, "Hughes HN/HX Systems provide high-

speed IP satellite connectivity between corporate headquarters and/or the Internet and multiple remote sites. HN/HX Systems include a variety of standard and specialized IP features designed to optimize space segment and minimize latencies for IP networking protocols and services. ... PEP packet payload compression uses the V.44 lossless compression algorithm. V.44 is an ITU standardized compression technology based on a Hughes-patented compression algorithm.” See, e.g.,

<http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 2, 9; <https://tools.ietf.org/html/rfc3051> (“V.44 Packet Method is based upon the LZJH data compression algorithm. Throughout the remainder of this document the terms V.44 Packet Method and LZJH are synonymous.

... **4.4 Minimum packet size threshold:** As stated in [RFC2393], small packets may not compress well. Informal tests using the LZJH algorithm on internet web pages and e-mail files show that the average payload size that typically produces expanded data is approximately 50 bytes. Thus, **implementations may prefer not to attempt to compress payloads of approximately 50 bytes or smaller.** **4.5 Compressibility test:**

The LZJH algorithm, as described in [V44], **is easily modified to incorporate an adaptive compressibility test**, as referenced in [RFC2393]. Annex B of [V44] specifies the mechanism for including such a test in LZJH.”). Defendants specifically intended and were aware that the normal and customary use of the Accused Instrumentality would infringe the ‘867 patent. Defendants performed the acts that constitute induced infringement, and would induce actual infringement, with the knowledge of the ‘867 patent and with the knowledge, or willful blindness to the probability, that the induced acts would constitute infringement. On information and belief, Defendants engaged in such inducement to promote the sales of the Accused Instrumentality, *e.g.*, through Defendants’ user manuals, product support, marketing materials, and training materials to actively induce the users of the Accused Instrumentality to infringe the ‘867 patent. Accordingly, Defendants have induced since the filing of the original Complaint on

February 14, 2017 and continue to induce users of the Accused Instrumentality to use the Accused Instrumentality in its ordinary and customary way to infringe the ‘867 patent, knowing that such use constitutes infringement of the ‘867 patent.

62. The Accused Instrumentality practices a method comprising: receiving a plurality of data blocks. See, e.g., <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 2:

Hughes HN/HX Systems provide high-speed IP satellite connectivity between corporate headquarters and/or the Internet and multiple remote sites.

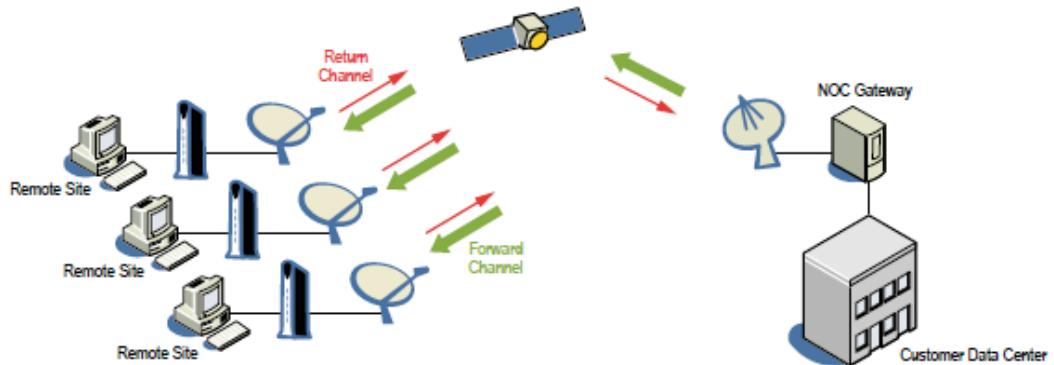


Figure 1. System Overview

63. Upon information and belief, the Accused Instrumentality determines whether or not to compress each one of said plurality of data blocks with a particular one or more of several encoders. See, e.g., <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 9 (“PEP packet payload compression uses the V.44 lossless compression algorithm. V.44 is an ITU standardized compression technology based on a Hughes-patented compression algorithm.”); <https://tools.ietf.org/html/rfc3051> (“V.44 Packet Method is based upon the LZJH data compression algorithm. Throughout the remainder of this document the terms V.44 Packet Method and LZJH are synonymous. ... **4.4 Minimum packet size threshold:** As stated in [RFC2393], small packets may not compress well. Informal tests using the LZJH algorithm on internet web pages and e-mail files show that the average

payload size that typically produces expanded data is approximately 50 bytes. Thus, **implementations may prefer not to attempt to compress payloads of approximately 50 bytes or smaller.** **4.5 Compressibility test:** The LZJH algorithm, as described in [V44], is easily modified to incorporate an adaptive compressibility test, as referenced in [RFC2393]. Annex B of [V44] specifies the mechanism for including such a test in LZJH.”).).

64. Upon information and belief, in the Accused Instrumentality, if said determination is to compress with said particular one or more of said several encoders for a particular one of said plurality of data blocks; compressing said particular one of said plurality of data blocks with said particular one or more of said several encoders to provide a compressed data block. See, e.g., <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 9 (“PEP packet payload compression uses the V.44 lossless compression algorithm. V.44 is an ITU standardized compression technology based on a Hughes-patented compression algorithm.”); <https://tools.ietf.org/html/rfc3051> (“V.44 Packet Method is based upon the LZJH data compression algorithm. Throughout the remainder of this document the terms V.44 Packet Method and LZJH are synonymous. ... **4.4 Minimum packet size threshold:** As stated in [RFC2393], small packets may not compress well. Informal tests using the LZJH algorithm on internet web pages and e-mail files show that the average payload size that typically produces expanded data is approximately 50 bytes. Thus, **implementations may prefer not to attempt to compress payloads of approximately 50 bytes or smaller.** **4.5 Compressibility test:** The LZJH algorithm, as described in [V44], is easily modified to incorporate an adaptive compressibility test, as referenced in [RFC2393]. Annex B of [V44] specifies the mechanism for including such a test in LZJH.”)).

65. Upon information and belief, the Accused Instrumentality provides a data compression type descriptor representative of said particular one or more of said several

encoders and outputs said data compression type descriptor and said compressed data block. See, e.g., <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 9 (“PEP packet payload compression uses the V.44 lossless compression algorithm. V.44 is an ITU standardized compression technology based on a Hughes-patented compression algorithm.”); <https://tools.ietf.org/html/rfc3051> (“V.44 Packet Method is based upon the LZJH data compression algorithm. Throughout the remainder of this document the terms V.44 Packet Method and LZJH are synonymous. ... **4.4 Minimum packet size threshold:** As stated in [RFC2393], small packets may not compress well. Informal tests using the LZJH algorithm on internet web pages and e-mail files show that the average payload size that typically produces expanded data is approximately 50 bytes. Thus, **implementations may prefer not to attempt to compress payloads of approximately 50 bytes or smaller.** **4.5 Compressibility test:** The LZJH algorithm, as described in [V44], is easily modified to incorporate an adaptive compressibility test, as referenced in [RFC2393]. Annex B of [V44] specifies the mechanism for including such a test in LZJH.”)).

66. Upon information and belief, if said determination is to not compress said particular one of said plurality of data blocks; the Accused Instrumentality provides a null data compression type descriptor representative of said determination not to compress; and outputting said null data compression type descriptor and said particular one of said plurality of data blocks. See, e.g., <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 9 (“PEP packet payload compression uses the V.44 lossless compression algorithm. V.44 is an ITU standardized compression technology based on a Hughes-patented compression algorithm.”); <https://tools.ietf.org/html/rfc3051> (“V.44 Packet Method is based upon the LZJH data compression algorithm. Throughout the remainder of this document the terms V.44 Packet Method and LZJH are synonymous. ... **4.4 Minimum packet size**

threshold: As stated in [RFC2393], small packets may not compress well. Informal tests using the LZJH algorithm on internet web pages and e-mail files show that the average payload size that typically produces expanded data is approximately 50 bytes. Thus, **implementations may prefer not to attempt to compress payloads of approximately 50 bytes or smaller.** **4.5 Compressibility test:** The LZJH algorithm, as described in [V44], is easily modified to incorporate an adaptive compressibility test, as referenced in [RFC2393]. Annex B of [V44] specifies the mechanism for including such a test in LZJH.”.).

67. Defendants also infringe other claims of the ‘867 patent, directly and through inducing infringement, for similar reasons as explained above with respect to Claim 16 of the ‘867 patent.

68. By making, using, offering for sale, selling and/or importing into the United States the Accused Instrumentality, and touting the benefits of using the Accused Instrumentality’s compression features, Defendants have injured Realtime and are liable to Realtime for infringement of the ‘867 patent pursuant to 35 U.S.C. § 271.

69. As a result of Defendants’ infringement of the ‘867 patent, Plaintiff Realtime is entitled to monetary damages in an amount adequate to compensate for Defendants’ infringement, but in no event less than a reasonable royalty for the use made of the invention by Defendants, together with interest and costs as fixed by the Court.

Accused Instrumentality Including Hughes Web Optimizer

70. On information and belief, Defendants have offered for sale, sold and/or imported into the United States Hughes products that infringe the ‘867 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Defendants’ products and services, such as Hughes Web Optimizer, and all versions and variations thereof since the issuance of the ‘867 patent (“Accused Instrumentality”).

71. On information and belief, Defendants have directly infringed and

continue to infringe the ‘867 patent, for example, through their own use and testing of the accused products to practice compression methods claimed by the ‘867 patent, including a method comprising: receiving a plurality of data blocks; determining whether or not to compress each one of said plurality of data blocks with a particular one or more of several encoders; if said determination is to compress with said particular one or more of said several encoders for a particular one of said plurality of data blocks; compressing said particular one of said plurality of data blocks with said particular one or more of said several encoders to provide a compressed data block; providing a data compression type descriptor representative of said particular one or more of said several encoders; outputting said data compression type descriptor and said compressed data block; if said determination is to not compress said particular one of said plurality of data blocks; providing a null data compression type descriptor representative of said determination not to compress; and outputting said null data compression type descriptor and said particular one of said plurality of data blocks. On information and belief, Defendants use the Accused Instrumentality in its ordinary and customary fashion for their own internal non-testing business purposes, while testing the Accused Instrumentality, and while providing technical support and repair services for the Accused Instrumentality to Defendants’ customers, and use of the Accused Instrumentality in its ordinary and customary fashion results in infringement of the methods claimed by the ‘867 patent.

72. On information and belief, Defendants have had knowledge of the ‘867 patent since at least the filing of this Complaint or shortly thereafter, and on information and belief, Defendants knew of the ‘867 patent and knew of their infringement, including by way of this lawsuit.

73. Defendants’ affirmative acts of making, using, selling, offering for sale, and/or importing the Accused Instrumentality have induced since the filing of the original Complaint on February 14, 2017 and continue to induce users of the Accused Instrumentality to use the Accused Instrumentality in its normal and customary way to

infringe the ‘867 patent by practicing compression methods claimed by the ‘867 patent, including a method comprising: receiving a plurality of data blocks; determining whether or not to compress each one of said plurality of data blocks with a particular one or more of several encoders; if said determination is to compress with said particular one or more of said several encoders for a particular one of said plurality of data blocks; compressing said particular one of said plurality of data blocks with said particular one or more of said several encoders to provide a compressed data block; providing a data compression type descriptor representative of said particular one or more of said several encoders; outputting said data compression type descriptor and said compressed data block; if said determination is to not compress said particular one of said plurality of data blocks; providing a null data compression type descriptor representative of said determination not to compress; and outputting said null data compression type descriptor and said particular one of said plurality of data blocks. For example, Defendants explain to customers the benefits of using the Accused Instrumentality, “In addition to the payload optimization techniques already mentioned, Defendants have also implemented “Web Optimizers,” which work at the HTTP layer and are able to compress HTTP content. A Web Optimizer is typically implemented as a server at the HN or HX hub station and applies a number of data-specific compression techniques including image compression for JPG and GIF images. Through the application of the Web Optimizer, Hughes can reduce HTTP traffic volume by up to 30 percent. It should be noted that the application of compression on images results in loss of image quality. The higher the compression savings the greater the impact to image quality.” See, e.g., <http://www.hughes.com/resources/hn-slash-hx-bandwidth-efficiency/download?locale=en> at 6. Defendants specifically intended and were aware that the normal and customary use of the Accused Instrumentality would infringe the ‘867 patent. Defendants performed the acts that constitute induced infringement, and would induce actual infringement, with the knowledge of the ‘867 patent and with the knowledge, or willful blindness to the probability, that the induced

acts would constitute infringement. On information and belief, Defendants engaged in such inducement to promote the sales of the Accused Instrumentality, *e.g.*, through Defendants' user manuals, product support, marketing materials, and training materials to actively induce the users of the Accused Instrumentality to infringe the '867 patent. Accordingly, Defendants have induced since the filing of the original Complaint on February 14, 2017 and continue to induce users of the Accused Instrumentality to use the Accused Instrumentality in its ordinary and customary way to infringe the '867 patent, knowing that such use constitutes infringement of the '867 patent.

74. The Accused Instrumentality practices a method comprising: receiving a plurality of data blocks, *e.g.*, from the Internet. *See, e.g.*, <http://www.hughes.com/resources/hn-slash-hx-bandwidth-efficiency/download?locale=en> at 6 ("In addition to the payload optimization techniques already mentioned, Defendants have also implemented "Web Optimizers," which work at the HTTP layer and are able to compress HTTP content. A Web Optimizer is typically implemented as a server at the HN or HX hub station ... Figure 8 illustrates that the Web Optimizer is placed between the Internet and the satellite network hub.")

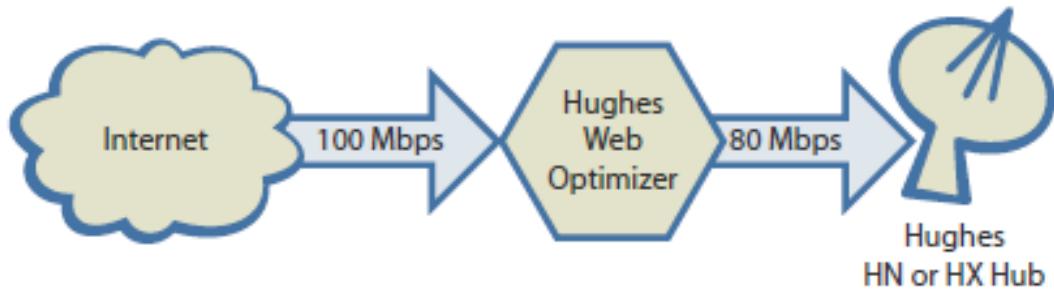


Figure 8. Web Optimizer Implementation

75. Upon information and belief, the Accused Instrumentality determines whether or not to compress each one of said plurality of data blocks with a particular one or more of several encoders. For example, as the Accused Instrumentality "applies a

number of data-specific compression techniques including image compression for JPG and GIF images”, there may be certain data types that are not compressed. *See, e.g.*, <http://www.hughes.com/resources/hn-slash-hx-bandwidth-efficiency/download?locale=en> at 6.

76. Upon information and belief, in the Accused Instrumentality, if said determination is to compress with said particular one or more of said several encoders for a particular one of said plurality of data blocks; compressing said particular one of said plurality of data blocks with said particular one or more of said several encoders to provide a compressed data block. For example, the Accused Instrumentality compresses JPG images with one technique and GIF images with another technique. *See, e.g.*, <http://www.hughes.com/resources/hn-slash-hx-bandwidth-efficiency/download?locale=en> at 6 (“Web Optimizer … applies a number of data-specific compression techniques including image compression for JPG and GIF images”).

77. Upon information and belief, the Accused Instrumentality provides a data compression type descriptor representative of said particular one or more of said several encoders and outputs said data compression type descriptor and said compressed data block. *See, e.g.*, <http://www.hughes.com/resources/hn-slash-hx-bandwidth-efficiency/download?locale=en> at 6 (“Web Optimizer … applies a number of data-specific compression techniques including image compression for JPG and GIF images”).

78. Upon information and belief, if said determination is to not compress said particular one of said plurality of data blocks (for example, if the data is not a type for which a data-specific compression technique has been assigned); the Accused Instrumentality provides a null data compression type descriptor representative of said determination not to compress; and outputting said null data compression type descriptor and said particular one of said plurality of data blocks. *See, e.g.*, <http://www.hughes.com/resources/hn-slash-hx-bandwidth-efficiency/download?locale=en> at 6 (“Web Optimizer … applies a number of data-

specific compression techniques including image compression for JPG and GIF images").

79. Defendants also infringe other claims of the '867 patent, directly and through inducing infringement, for similar reasons as explained above with respect to Claim 16 of the '867 patent.

80. By making, using, offering for sale, selling and/or importing into the United States the Accused Instrumentality, and touting the benefits of using the Accused Instrumentality's compression features, Defendants have injured Realtime and are liable to Realtime for infringement of the '867 patent pursuant to 35 U.S.C. § 271.

81. As a result of Defendants' infringement of the '867 patent, Plaintiff Realtime is entitled to monetary damages in an amount adequate to compensate for Defendants' infringement, but in no event less than a reasonable royalty for the use made of the invention by Defendants, together with interest and costs as fixed by the Court.

COUNT IV

INFRINGEMENT OF U.S. PATENT NO. 8,502,707

82. Plaintiff realleges and incorporates by reference paragraphs 1-81 above, as if fully set forth herein.

83. Plaintiff Realtime is the owner by assignment of United States Patent No. 8,502,707 entitled "Data compression systems and methods." The '707 patent was duly and legally issued by the United States Patent and Trademark Office on August 6, 2013. A true and correct copy of the '707 Patent is included as Exhibit D.

Accused Instrumentality Including HN/HX Systems

84. On information and belief, Defendants have offered for sale, sold and/or imported into the United States Hughes products that infringe the '707 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Defendants' products and services, such as HN/HX Systems, and all versions and variations thereof since the issuance of the '707 patent ("Accused

Instrumentality").

85. On information and belief, Defendants have directly infringed and continue to infringe the '707 patent, for example, through their own use and testing of the accused products to practice compression methods claimed by the '707 patent, including a method comprising: receiving a data block; outputting data, wherein said outputted data is determined to be: said data block in received form, or a compressed data block wherein said compressed data block is provided by one of a plurality of compression techniques based on a determination between said plurality of compression techniques, and a determination is made whether data expansion occurred with respect to said compressed data block; and outputting a descriptor with said outputted data indicative of no compression or the one of said plurality of compression techniques utilized to provide said compressed data block. On information and belief, Defendants use the Accused Instrumentality in its ordinary and customary fashion for their own internal non-testing business purposes, while testing the Accused Instrumentality, and while providing technical support and repair services for the Accused Instrumentality to Defendants' customers, and use of the Accused Instrumentality in its ordinary and customary fashion results in infringement of the methods claimed by the '707 patent.

86. On information and belief, Defendants have had knowledge of the '707 patent since at least the filing of this Complaint or shortly thereafter, and on information and belief, Defendants knew of the '707 patent and knew of their infringement, including by way of this lawsuit.

87. Defendants' affirmative acts of making, using, selling, offering for sale, and/or importing the Accused Instrumentality have induced since the filing of the original Complaint on February 14, 2017 and continue to induce users of the Accused Instrumentality to use the Accused Instrumentality in its normal and customary way to infringe the '707 patent by practicing compression methods claimed by the '707 patent, including a method comprising: receiving a data block; outputting data, wherein said

outputted data is determined to be: said data block in received form, or a compressed data block wherein said compressed data block is provided by one of a plurality of compression techniques based on a determination between said plurality of compression techniques, and a determination is made whether data expansion occurred with respect to said compressed data block; and outputting a descriptor with said outputted data indicative of no compression or the one of said plurality of compression techniques utilized to provide said compressed data block. For example, Defendants explain to customers the benefits of using the Accused Instrumentality, “Hughes HN/HX Systems provide high-speed IP satellite connectivity between corporate headquarters and/or the Internet and multiple remote sites. HN/HX Systems include a variety of standard and specialized IP features designed to optimize space segment and minimize latencies for IP networking protocols and services. … PEP packet payload compression uses the V.44 lossless compression algorithm. V.44 is an ITU standardized compression technology based on a Hughes-patented compression algorithm.” See, e.g., <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 2, 9; <https://tools.ietf.org/html/rfc3051> (“V.44 Packet Method is based upon the LZJH data compression algorithm. Throughout the remainder of this document the terms V.44 Packet Method and LZJH are synonymous. … **4.4 Minimum packet size threshold:** As stated in [RFC2393], small packets may not compress well. Informal tests using the LZJH algorithm on internet web pages and e-mail files show that the average payload size that typically produces expanded data is approximately 50 bytes. Thus, **implementations may prefer not to attempt to compress payloads of approximately 50 bytes or smaller.** **4.5 Compressibility test:** The LZJH algorithm, as described in [V44], **is easily modified to incorporate an adaptive compressibility test**, as referenced in [RFC2393]. Annex B of [V44] specifies the mechanism for including such a test in LZJH.”). Defendants specifically intended and were aware that the normal and customary use of the Accused Instrumentality would

infringe the '707 patent. Defendants performed the acts that constitute induced infringement, and would induce actual infringement, with the knowledge of the '707 patent and with the knowledge, or willful blindness to the probability, that the induced acts would constitute infringement. On information and belief, Defendants engaged in such inducement to promote the sales of the Accused Instrumentality, *e.g.*, through Defendants' user manuals, product support, marketing materials, and training materials to actively induce the users of the Accused Instrumentality to infringe the '707 patent. Accordingly, Defendants have induced since the filing of the original Complaint on February 14, 2017 and continue to induce users of the Accused Instrumentality to use the Accused Instrumentality in its ordinary and customary way to infringe the '707 patent, knowing that such use constitutes infringement of the '707 patent.

88. The Accused Instrumentality practices a method comprising: receiving a data block. See, *e.g.*, <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 2:

Hughes HN/HX Systems provide high-speed IP satellite connectivity between corporate headquarters and/or the Internet and multiple remote sites.

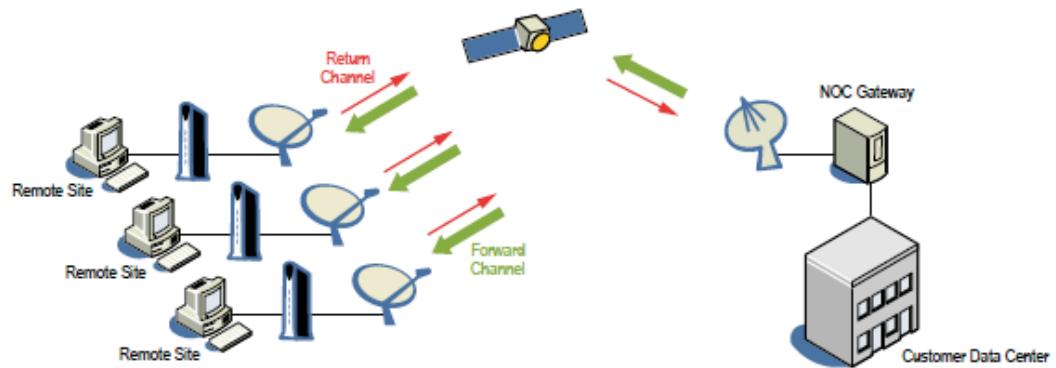


Figure 1. System Overview

89. On information and belief, the Accused Instrumentality outputs data, wherein said outputted data is determined to be: said data block in received form, or a compressed data block. See, *e.g.*, <http://www.hughes.com/resources/key-features-of->

hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en at 2:

Hughes HN/HX Systems provide high-speed IP satellite connectivity between corporate headquarters and/or the Internet and multiple remote sites.

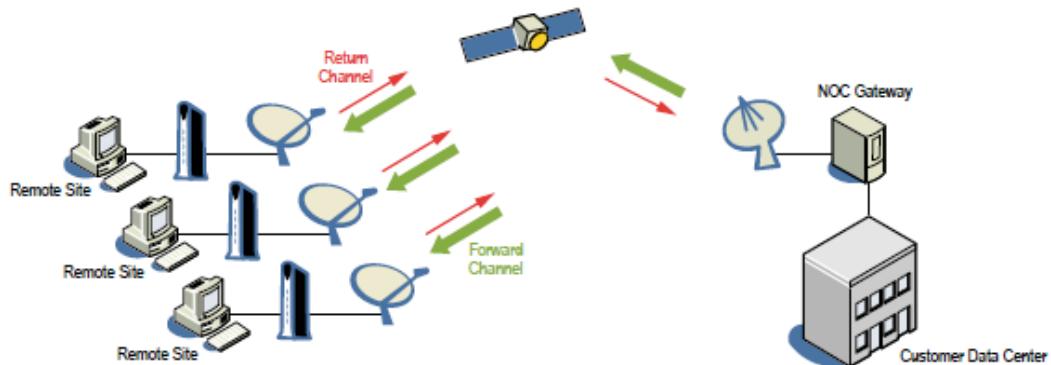


Figure 1. System Overview

<http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 9 (“PEP packet payload compression uses the V.44 lossless compression algorithm. V.44 is an ITU standardized compression technology based on a Hughes-patented compression algorithm.”); <https://tools.ietf.org/html/rfc3051> (“V.44 Packet Method is based upon the LZJH data compression algorithm. Throughout the remainder of this document the terms V.44 Packet Method and LZJH are synonymous. ... **4.4 Minimum packet size threshold:** As stated in [RFC2393], small packets may not compress well. Informal tests using the LZJH algorithm on internet web pages and e-mail files show that the average payload size that typically produces expanded data is approximately 50 bytes. Thus, **implementations may prefer not to attempt to compress payloads of approximately 50 bytes or smaller.** **4.5 Compressibility test:** The LZJH algorithm, as described in [V44], is easily modified to incorporate an adaptive compressibility test, as referenced in [RFC2393]. Annex B of [V44] specifies the mechanism for including such a test in LZJH.”)).

90. In the Accused Instrumentality, the compressed data block is provided by one of a plurality of compression techniques based on a determination between said

plurality of compression techniques. See, e.g., <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 8-9 (“HN/HX Systems provide IP/TCP/UDP/RTP header compression and payload compression in both inbound and outbound directions. A standard TCP/IP header is 40 bytes per packet, and most of that information is redundant for a given session. Header compression suppresses any redundant information, reducing the bandwidth required for the header. This compression capability requires that a large number of the fields either do not change or change only in expected ways. Inbound header compression compresses TCP/IP headers from 40 bytes to 10–12 bytes, reducing typical bandwidth usage by 15–20%. The inbound compression algorithm is a Hughes-extended version of RFC 1144. Multiple types of IP headers can be compressed, including IP headers, UDP headers, TCP headers, RTP headers, and Hughes’ PBP headers. Outbound header compression compresses IP, UDP, and RTP headers using the header fields that do not change or change in predictable ways. The outbound compression algorithm is based on RFC 3095, Robust Header Compression, and the Hughes inbound header compression algorithm. IP/UDP/RTP headers for RTP packets (types G.729 and G.723.1) are compressed. With outbound header compression, the size of the IP/UDP/RTP headers becomes 5 bytes from 40 bytes. With an average RTP payload size of 20 bytes, the expected compression ratio for IP/UDP/RTP packets is $35/(40+20) = 58.3\%$. PEP packet payload compression uses the V.44 lossless compression algorithm. V.44 is an ITU standardized compression technology based on a Hughes-patented compression algorithm. The PEP stateful compression implementation takes advantage of the guaranteed, in-order delivery service provided by the PEP backbone protocol. Stateful compression is able to take advantage of redundancy in all messages being sent instead of only redundancy within a message, thus providing significantly better compression ratios. Compression ratios of up to 12:1 are achieved. HN/HX Systems feature IP Payload Compression for UDP Packets utilizing the IP Payload Compression Protocol (IPComp) per RFC 3173 to compress UDP traffic

(for example, DNS, BRP, SNMP, Multicast traffic) using a lossless, stateless compression algorithm. The bandwidth savings is a function of traffic type. Bandwidth usage for typical DNS request traffic will be reduced by 10%, DNS responses by 30%, and SNMP traffic by 50%.”).

91. On information and belief, in the Accused Instrumentality, a determination is made whether data expansion occurred with respect to said compressed data block. See, e.g., <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 9 (“PEP packet payload compression uses the V.44 lossless compression algorithm. V.44 is an ITU standardized compression technology based on a Hughes-patented compression algorithm.”); <https://tools.ietf.org/html/rfc3051> (“V.44 Packet Method is based upon the LZJH data compression algorithm. Throughout the remainder of this document the terms V.44 Packet Method and LZJH are synonymous. ... **4.4 Minimum packet size threshold:** As stated in [RFC2393], small packets may not compress well. Informal tests using the LZJH algorithm on internet web pages and e-mail files show that the average payload size that typically produces **expanded data** is approximately 50 bytes. Thus, **implementations may prefer not to attempt to compress payloads of approximately 50 bytes or smaller.** **4.5 Compressibility test:** The LZJH algorithm, as described in [V44], is easily modified to incorporate an adaptive compressibility test, as referenced in [RFC2393]. Annex B of [V44] specifies the mechanism for including such a test in LZJH.”)).

92. On information and belief, the Accused Instrumentality outputs a descriptor with said outputted data indicative of no compression or the one of said plurality of compression techniques utilized to provide said compressed data block. See, e.g., <http://www.hughes.com/resources/key-features-of-hughes-hn-slash-hx-broadband-satellite-routers/download?locale=en> at 9 (“HN/HX Systems provide IP/TCP/UDP/RTP header compression and payload compression in both inbound and outbound directions.

A standard TCP/IP header is 40 bytes per packet, and most of that information is redundant for a given session. Header compression suppresses any redundant information, reducing the bandwidth required for the header. This compression capability requires that a large number of the fields either do not change or change only in expected ways. Inbound header compression compresses TCP/IP headers from 40 bytes to 10–12 bytes, reducing typical bandwidth usage by 15—20%. The inbound compression algorithm is a Hughes-extended version of RFC 1144. Multiple types of IP headers can be compressed, including IP headers, UDP headers, TCP headers, RTP headers, and Hughes' PBP headers. Outbound header compression compresses IP, UDP, and RTP headers using the header fields that do not change or change in predictable ways. The outbound compression algorithm is based on RFC 3095, Robust Header Compression, and the Hughes inbound header compression algorithm. IP/UDP/RTP headers for RTP packets (types G.729 and G.723.1) are compressed. With outbound header compression, the size of the IP/UDP/RTP headers becomes 5 bytes from 40 bytes. With an average RTP payload size of 20 bytes, the expected compression ratio for IP/UDP/RTP packets is $35/(40+20) = 58.3\%$. PEP packet payload compression uses the V.44 lossless compression algorithm. V.44 is an ITU standardized compression technology based on a Hughes-patented compression algorithm. The PEP stateful compression implementation takes advantage of the guaranteed, in-order delivery service provided by the PEP backbone protocol. Stateful compression is able to take advantage of redundancy in all messages being sent instead of only redundancy within a message, thus providing significantly better compression ratios. Compression ratios of up to 12:1 are achieved. HN/HX Systems feature IP Payload Compression for UDP Packets utilizing the IP Payload Compression Protocol (IPComp) per RFC 3173 to compress UDP traffic (for example, DNS, BRP, SNMP, Multicast traffic) using a lossless, stateless compression algorithm. The bandwidth savings is a function of traffic type. Bandwidth usage for typical DNS request traffic will be reduced by 10%, DNS responses by 30%, and SNMP

traffic by 50%.”); <https://tools.ietf.org/html/rfc3051> (“V.44 Packet Method is based upon the LZJH data compression algorithm. Throughout the remainder of this document the terms V.44 Packet Method and LZJH are synonymous. ... **4.4 Minimum packet size threshold:** As stated in [RFC2393], small packets may not compress well. Informal tests using the LZJH algorithm on internet web pages and e-mail files show that the average payload size that typically produces **expanded data** is approximately 50 bytes. Thus, **implementations may prefer not to attempt to compress payloads of approximately 50 bytes or smaller.** **4.5 Compressibility test:** The LZJH algorithm, as described in [V44], is easily modified to incorporate an adaptive compressibility test, as referenced in [RFC2393]. Annex B of [V44] specifies the mechanism for including such a test in LZJH.”)).

93. Defendants also infringe other claims of the ‘707 patent, directly and through inducing infringement and contributory infringement, for similar reasons as explained above with respect to Claim 16 of the ‘707 patent.

94. By making, using, offering for sale, selling and/or importing into the United States the Accused Instrumentality, and touting the benefits of using the Accused Instrumentality’s compression features, Defendants have injured Realtime and are liable to Realtime for infringement of the ‘707 patent pursuant to 35 U.S.C. § 271.

95. As a result of Defendants’ infringement of the ‘707 patent, Plaintiff Realtime is entitled to monetary damages in an amount adequate to compensate for Defendants’ infringement, but in no event less than a reasonable royalty for the use made of the invention by Defendants, together with interest and costs as fixed by the Court.’

COUNT V

INFRINGEMENT OF U.S. PATENT NO. 8,275,897

96. Plaintiff realleges and incorporates by reference paragraphs 1-95 above, as

if fully set forth herein.

97. Plaintiff Realtime is the owner by assignment of United States Patent No. 8,275,897 (“the ‘897 patent”) entitled “System and methods for accelerated data storage and retrieval.” The ‘897 patent was duly and legally issued by the United States Patent and Trademark Office on September 25, 2012. A true and correct copy of the ‘897 patent is included as Exhibit E.

98. On information and belief, Dish Networks Corporation and/or Dish Networks L.L.C. (collectively, “Dish”) have made, used, offered for sale, sold and/or imported into the United States Dish products and services that infringe the ‘897 patent, and continues to do so. By way of illustrative example, these infringing products and services include, without limitation, Dish’s streaming video products and services compliant with various versions of the H.264 video compression standard, such as, *e.g.*, the Dish TV service, Hopper with Sling, and all versions and variations thereof since the issuance of the ‘897 patent (“Accused Instrumentalities”). *See, e.g.*, <https://forum.dish.com/viewtopic.php?t=9864&p=58341> (“[S]atellite services (*e.g.*, DirecTV, XstreamHD and Dish Network) utilize the 1080p/24-30 format with MPEG-4 AVC/H.264 encoding for pay-per-view movies that are downloaded in advance via satellite or on-demand via broadband.”); <http://www.satelliteguys.us/xen/threads/hd-bitrate-is-under-5-mb-s-for-most-channels-is-this-correct.256211/> (“For HD video DN exclusively uses H.264 compression (sometimes ambiguously referred to here as MPEG-4, as there is more than one MPEG-4 video compression format). H.264 is about 2X more efficient than MPEG-2 for the same video quality.”); <http://www.laptopmag.com/reviews/wireless-networking/hopper-with-sling>; <http://www.tivocommunity.com/community/index.php?threads/capturing-slingbox-350-500-video.504853/> (“For the newer Slingboxes the video is H.264.”); <https://answers.slingbox.com/thread/3940> (“I have the SlingBox Solo and by all accounts it streams h.264.”).

99. On information and belief, Sling TV has made, used, offered for sale, sold and/or imported into the United States Sling TV products and services that infringe the ‘897 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Sling TV’s streaming video products and services compliant with various versions of the H.264 video compression standard, such as, *e.g.*, Sling Orange and Sling Blue, and all versions and variations thereof since the issuance of the ‘897 patent (“Accused Instrumentalities”). See, *e.g.*, <https://www.sling.com/> (“Sling TV offers two domestic streaming services: The single-stream Sling Orange service and the multi-stream Sling Blue service.”); https://www.reddit.com/r/slingtv/comments/2ynmxx/what_resolutions_are_the_channels_in/ (“OTA broadcasts use MPEG-2, which is far less efficient than the H.264 used by Sling, which needs far less data than MPEG-2 to deliver similar quality.”).

100. On information and belief, Sling Media has made, used, offered for sale, sold and/or imported into the United States Sling Media products and services that infringe the ‘897 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Sling Media’s streaming video products and services compliant with various versions of the H.264 video compression standard, such as, *e.g.*, Slingbox set-top boxes (including, but not limited to, Slingbox 500, Slingbox M2, Slingbox M1, Slingbox 350, and Sling Adapter), and all versions and variations thereof since the issuance of the ‘897 patent (“Accused Instrumentalities”). See, *e.g.*, <http://www.tivocommunity.com/community/index.php?threads/capturing-slingbox-350-500-video.504853/> (“For the newer Slingboxes the video is H.264.”); <https://answers.slingbox.com/thread/3940> (“I have the SlingBox Solo and by all accounts it streams h.264.”)).

101. On information and belief, Arris has made, used, offered for sale, sold and/or imported into the United States Arris products and services that infringe the ‘897 patent, and continues to do so. By way of illustrative example, these infringing products

include, without limitation, Arris's streaming video products and services compliant with various versions of the H.264 video compression standard, such as, *e.g.*, Arris MS4000, and all versions and variations thereof since the issuance of the '897 patent ("Accused Instrumentalities"). *See, e.g.,* <http://www.arris.com/products/media-streamer-ms4000/> ("Transcode to H.264 with adaptive bitrate up to 4 Live/DVR streams").

102. On information and belief, each of Dish, Sling TV, Sling Media, and Arris has directly infringed and continues to infringe the '897 patent, for example, through its own sale, offer for sale, importation, use and testing of the Accused Instrumentalities, which constitute devices claimed by Claim 46 of the '897 patent, namely, a device for accelerating data transmittal on an output to a data storage device, the output associated with an output transmission rate, comprising: an input buffer capable of receiving a data stream comprising a plurality of data blocks, the data stream in a received form and temporarily storing the plurality of data blocks; a data accelerator capable of: (i) receiving a data parameter that indicates an amount of information loss permissible for the data stream; (ii) selecting, for a data block, a compression technique from a plurality of compression techniques based, at least in part, on the data parameter; (iii) compressing the data block using the compression technique to determine a compressed data block; and (iv) transmitting, on the output to the data storage device, the compressed data block in a compressed data stream to the data storage device, the compressing and the transmitting together occurring more quickly than a length of time to transmit the data block on the output in the received form. Upon information and belief, each of Dish, Sling TV, Sling Media, and Arris sells, offers for sale, and imports the Accused Instrumentalities in the United States, and also uses the Accused Instrumentalities for its own internal non-testing business purposes, while testing the Accused Instrumentalities, and while providing technical support and repair services for the Accused Instrumentalities to their customers.

103. The Accused Instrumentalities are devices for accelerating data transmittal

on an output to a data storage device, the output associated with an output transmission rate, comprising: an input buffer capable of receiving a data stream comprising a plurality of data blocks, the data stream in a received form and temporarily storing the plurality of data blocks. On information and belief, the input of the Accused Instrumentalities' compression system must contain at least one buffer to help normalize the I/O while throughput changes.

104. The Accused Instrumentalities comprise a data accelerator capable of: (i) receiving a data parameter that indicates an amount of information loss permissible for the data stream. For example, the Accused Instrumentalities determine a parameter of at least a portion of a video data block. As shown below, examples of such parameters include resolution, which reflects the amount of information loss permissible for the data stream. Different parameters correspond to different end applications. The H.264 standard provides for multiple different ranges of such parameters, each included in the "profiles" and "levels" defined by the H.264 standard. See http://www.axis.com/files/whitepaper/wp_h264_31669_en_0803_lo.pdf at 5.

4. H.264 profiles and levels

The joint group involved in defining H.264 focused on creating a simple and clean solution, limiting options and features to a minimum. An important aspect of the standard, as with other video standards, is providing the capabilities in profiles (sets of algorithmic features) and levels (performance classes) that optimally support popular productions and common formats.

H.264 has seven profiles, each targeting a specific class of applications. Each profile defines what feature set the encoder may use and limits the decoder implementation complexity.

Network cameras and video encoders will most likely use a profile called the baseline profile, which is intended primarily for applications with limited computing resources. The baseline profile is the most suitable given the available performance in a real-time encoder that is embedded in a network video product. The profile also enables low latency, which is an important requirement of surveillance video and also particularly important in enabling real-time, pan/tilt/zoom (PTZ) control in PTZ network cameras.

H.264 has 11 levels or degree of capability to limit performance, bandwidth and memory requirements. Each level defines the bit rate and the encoding rate in macroblock per second for resolutions ranging from QCIF to HDTV and beyond. The higher the resolution, the higher the level required.

See https://en.wikipedia.org/wiki/H.264/MPEG-4_AVC:

Levels with maximum property values								
Level	Max decoding speed		Max frame size		Max video bit rate for video coding layer (VCL) kbit/s			Examples for high resolution @ highest frame rate (max stored frames) Toggle additional details
	Luma samples/s	Macroblocks/s	Luma samples	Macroblocks	Baseline, Extended and Main Profiles	High Profile	High 10 Profile	
1	380,160	1,485	25,344	99	64	80	192	176x144@15.0 (4)
1b	380,160	1,485	25,344	99	128	160	384	176x144@15.0 (4)
1.1	768,000	3,000	101,376	396	192	240	576	352x288@7.5 (2)
1.2	1,536,000	6,000	101,376	396	384	480	1,152	352x288@15.2 (6)
1.3	3,041,280	11,880	101,376	396	768	960	2,304	352x288@30.0 (6)
2	3,041,280	11,880	101,376	396	2,000	2,500	6,000	352x288@30.0 (6)
2.1	5,068,800	19,800	202,752	792	4,000	5,000	12,000	352x576@25.0 (6)
2.2	5,184,000	20,250	414,720	1,620	4,000	5,000	12,000	720x576@12.5 (5)
3	10,368,000	40,500	414,720	1,620	10,000	12,500	30,000	720x576@25.0 (5)
3.1	27,648,000	108,000	921,600	3,600	14,000	17,500	42,000	1,280x720@30.0 (5)
3.2	55,296,000	216,000	1,310,720	5,120	20,000	25,000	60,000	1,280x1,024@42.2 (4)
4	62,914,560	245,760	2,097,152	8,192	20,000	25,000	60,000	2,048x1,024@30.0 (4)
4.1	62,914,560	245,760	2,097,152	8,192	50,000	62,500	150,000	2,048x1,024@30.0 (4)
4.2	133,693,440	522,240	2,228,224	8,704	50,000	62,500	150,000	2,048x1,080@60.0 (4)
5	150,994,944	589,824	5,652,480	22,080	135,000	168,750	405,000	3,672x1,536@26.7 (5)
5.1	251,658,240	983,040	9,437,184	36,864	240,000	300,000	720,000	4,096x2,304@26.7 (5)
5.2	530,841,600	2,073,600	9,437,184	36,864	240,000	300,000	720,000	4,096x2,304@56.3 (5)

105. The Accused Instrumentalities comprise a data accelerator capable of: (ii) selecting, for a data block, a compression technique from a plurality of compression techniques based at least in part, on the data parameter. Based on the bitrate and/or resolution parameter identified, any H.264-compliant system would determine the profile to which that parameter corresponds (e.g., “baseline,” “extended,” “main”, “high”), then select between at least two compression techniques. If baseline or extended is the corresponding profile, then the system will select a Context-Adaptive Variable Length Coding entropy encoder. If main or high is the corresponding profile, then the system will select a Context-Adaptive Binary Arithmetic Coding (“CABAC”) entropy encoder.

See <https://sonnati.wordpress.com/2007/10/29/how-h-264-works-part-ii/>

	Baseline	Extended	Main	High	High 10
I and P Slices	Yes	Yes	Yes	Yes	Yes
B Slices	No	Yes	Yes	Yes	Yes
SI and SP Slices	No	Yes	No	No	No
Multiple Reference Frames	Yes	Yes	Yes	Yes	Yes
In-Loop Deblocking Filter	Yes	Yes	Yes	Yes	Yes
CAVLC Entropy Coding	Yes	Yes	Yes	Yes	Yes
CABAC Entropy Coding	No	No	Yes	Yes	Yes
Flexible Macroblock Ordering (FMO)	Yes	Yes	No	No	No
Arbitrary Slice Ordering (ASO)	Yes	Yes	No	No	No
Redundant Slices (RS)	Yes	Yes	No	No	No
Data Partitioning	No	Yes	No	No	No
Interlaced Coding (PicAFF, MBAFF)	No	Yes	Yes	Yes	Yes
4:2:0 Chroma Format	Yes	Yes	Yes	Yes	Yes
Monochrome Video Format (4:0:0)	No	No	No	Yes	Yes
4:2:2 Chroma Format	No	No	No	No	No
4:4:4 Chroma Format	No	No	No	No	No
8 Bit Sample Depth	Yes	Yes	Yes	Yes	Yes
9 and 10 Bit Sample Depth	No	No	No	No	Yes
11 to 14 Bit Sample Depth	No	No	No	No	No
8x8 vs. 4x4 Transform Adaptivity	No	No	No	Yes	Yes
Quantization Scaling Matrices	No	No	No	Yes	Yes
Separate Cb and Cr QP control	No	No	No	Yes	Yes
Separate Color Plane Coding	No	No	No	No	No
Predictive Lossless Coding	No	No	No	No	No

See http://web.cs.ucla.edu/classes/fall03/cs218/paper/H.264_MPEG4_Tutorial.pdf

at 7:

The following table summarizes the two major types of entropy coding: Variable Length Coding (VLC) and Context Adaptive Binary Arithmetic Coding (CABAC). CABAC offers superior coding efficiency over VLC by adapting to the changing probability distribution of symbols, by exploiting correlation between symbols, and by adaptively exploiting bit correlations using arithmetic coding. H.264 also supports Context Adaptive Variable Length Coding (CAVLC) which offers superior entropy coding over VLC without the full cost of CABAC.

H.264 Entropy Coding – Comparison of Approaches

Characteristics	Variable Length Coding (VLC)	Context Adaptive Binary Arithmetic Coding(CABAC)
• Where it is used	MPEG-2, MPEG-4 ASP	H.264/MPEG-4 AVC (high efficiency option)
• Probability distribution	Static - Probabilities never change	Adaptive - Adjusts probabilities based on actual data
• Leverages correlation between symbols	No - Conditional probabilities ignored	Yes - Exploits symbol correlations by using "contexts"
• Non-integer code words	No - Low coding efficiency for high probability symbols	Yes - Exploits "arithmetic coding" which generates non-integer code words for higher efficiency

Moreover, the H.264 Standard requires a bit-flag descriptor, which is set to determine the correct decoder for the corresponding encoder. As shown below, if the flag = 0, then CAVLC must have been selected as the encoder; if the flag = 1, then CABAC must have been selected as the encoder. See

[https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-H.264-201304-S!!PDF-](https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-H.264-201304-S!!PDF-E&type=items)

[E&type=items](#) (Rec. ITU-T H.264 (04/2013)) at 80:

`entropy_coding_mode_flag` selects the entropy decoding method to be applied for the syntax elements for which two descriptors appear in the syntax tables as follows:

- If `entropy_coding_mode_flag` is equal to 0, the method specified by the left descriptor in the syntax table is applied (Exp-Golomb coded, see clause 9.1 or CAVLC, see clause 9.2).
- Otherwise (`entropy_coding_mode_flag` is equal to 1), the method specified by the right descriptor in the syntax table is applied (CABAC, see clause 9.3).

106. The Accused Instrumentalities comprise a data accelerator capable of: (iii) compressing the data block using the compression technique to determine a compressed data block. After being selected, the asymmetric compressors (CAVLC or CABAC) will

compress the video data to provide various compressed data blocks. See

<https://sonnati.wordpress.com/2007/10/29/how-h-264-works-part-ii/>:

Entropy Coding

For entropy coding, H.264 may use an enhanced VLC, a more complex context-adaptive variable-length coding (CAVLC) or an even more complex Context-adaptive binary-arithmetic coding (CABAC) which are complex techniques to losslessly compress syntax elements in the video stream knowing the probabilities of syntax elements in a given context. The use of CABAC can improve the compression of around 5-7%. CABAC may requires a 30-40% of total processing power to be accomplished.

See http://www.ijera.com/papers/Vol3_issue4/BM34399403.pdf at 2:

Most visual communication systems today use Baseline Profile. Baseline is the simplest H.264 profile and defines, for example, zigzag scanning of the picture and using 4:2:0 (YUV video formats) chrominance sampling. In Baseline Profile, the picture is split in blocks consisting of 4x4 pixels, and each block is processed separately. Another important element of the Baseline Profile is the use of Universal Variable Length Coding (UVLC) and Context Adaptive Variable Length Coding (CAVLC) entropy coding techniques.

The Extended and Main Profiles includes the functionality of the Baseline Profile and add improvements to the predictions algorithms. Since transmitting every single frame (think 30 frames per second for good quality video) is not feasible if you are trying to reduce the bit rate 1000-2000 times, temporal and motion prediction are heavily used in H.264, and allow transmitting only the difference between one frame and the previous frames. The result is spectacular efficiency gain, especially for scenes with little change and motion.

The High Profile is the most powerful profile in H.264, and it allows most efficient coding of video. For example, large coding gain achieved through the use of Context Adaptive Binary Arithmetic Coding (CABAC) encoding which is more efficient than the UVLC/CAVLC used in Baseline Profile.

The High Profile also uses adaptive transform that decides on the fly if 4x4 or 8x8-pixel blocks should be used. For example, 4x4 blocks are used for the parts of the picture that are dense with detail, while parts that have little detail are transformed using 8x8 blocks.

107. The Accused Instrumentalities comprise a data accelerator capable of: (iv) transmitting, on the output to the data storage device, the compressed data block in a compressed data stream to the data storage device. Upon information and belief, the Accused Instrumentalities (in both on-demand and live streaming systems) will transmit the compressed data blocks and store the compressed data blocks in buffers, hard disk, and other forms of memory/storage.

108. The compressing and the transmitting performed by the Accused Instrumentalities together occur more quickly than a length of time to transmit the data block on the output in the received form. Upon information and belief, despite the time required to compress with either asymmetric encoder (CAVLC or CABAC), the compression ratios are so high—typically 60:1 or higher—that transmission and storage will be accelerated for at least some, if not all, the video data. See <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.602.1581&rep=rep1&type=pdf> at 13:

Typical compression ratios to maintain excellent quality are:

- 10:1 for general images using JPEG
- 30:1 for general video using H.263 and MPEG-2
- 60:1 for general video using H.264 and WMV9

109. On information and belief, each of Dish, Sling TV, Sling Media, and Arris also directly infringes and continues to infringe other claims of the ‘897 patent, for similar reasons as explained above with respect to Claim 46 of the ‘897 patent.

110. On information and belief, all of the Accused Instrumentalities perform the claimed methods in substantially the same way, *e.g.*, in the manner specified in the H.264 standard.

111. On information and belief, use of the Accused Instrumentalities in their ordinary and customary fashion results in infringement of the ‘897 patent.

112. On information and belief, each of Dish, Sling TV, Sling Media, and Arris

has had knowledge of the ‘897 patent since at least since the filing of this Complaint or shortly thereafter, and on information and belief, each of Dish, Sling TV, Sling Media, and Arris knew of the ‘897 patent and knew of its infringement, including by way of this lawsuit.

113. Upon information and belief, the affirmative acts of each of Dish, Sling Media, and Arris of making, using, and selling the Accused Instrumentalities, and providing implementation services and technical support to users of the Accused Instrumentalities, have induced since the filing of this Amended Complaint and continue to induce users of the Accused Instrumentalities to use them in their normal and customary way to infringe Claim 46 of the ‘897 patent by using a device for accelerating data transmittal on an output to a data storage device, the output associated with an output transmission rate, comprising: an input buffer capable of receiving a data stream comprising a plurality of data blocks, the data stream in a received form and temporarily storing the plurality of data blocks; a data accelerator capable of: (i) receiving a data parameter that indicates an amount of information loss permissible for the data stream; (ii) selecting, for a data block, a compression technique from a plurality of compression techniques based, at least in part, on the data parameter; (iii) compressing the data block using the compression technique to determine a compressed data block; and (iv) transmitting, on the output to the data storage device, the compressed data block in a compressed data stream to the data storage device, the compressing and the transmitting together occurring more quickly than a length of time to transmit the data block on the output in the received form. For example, Dish instructs customers (e.g., of the Hopper with Sling) that they can, “Watch Live TV: Live sporting events, weather, news, and more – with a broadband-connected, Sling-enabled DVR and DISH Anywhere, you can watch all of your favorite channels anywhere you go! Watch Recorded TV: Access recorded shows from your broadband-connected, Sling-enabled DVR anywhere. You can even start watching on your TV and resume watching later on your computer or mobile

device!”. See, e.g., <https://www.mydish.com/dish-anywhere>. For example, Sling Media instructs customers that “Sling Media believes their programming methodology chooses the best encoding parameters based on the statistics observed by the Slingplayer. You can see the statistics that it uses for the algorithm which dynamically chooses the parameters” <https://answers.slingbox.com/thread/3940>. For example, Arris instructs its customers that the MS4000 can “[t]ranscode to H.264 with adaptive bitrate up to 4 Live/DVR streams”. See, e.g., https://www.arris.com/globalassets/resources/data-sheets/365-095-24637_ms4000.pdf. For similar reasons, each of Dish, Sling Media, and Arris also induces its customers to use the Accused Instrumentalities to infringe other claims of the ‘897 patent. Each of Dish, Sling Media, and Arris specifically intended and was aware that these normal and customary activities would infringe the ‘897 patent. Each of Dish, Sling Media, and Arris performed the acts that constitute induced infringement, and would induce actual infringement, with the knowledge of the ‘897 patent and with the knowledge, or willful blindness to the probability, that the induced acts would constitute infringement. On information and belief, each of Dish, Sling Media, and Arris engaged in such inducement to promote the sales of the Accused Instrumentalities. Accordingly, each of Dish, Sling Media, and Arris has induced and continue to induce users of the Accused Instrumentalities to use the Accused Instrumentalities in their ordinary and customary way to infringe the ‘897 patent, knowing that such use constitutes infringement of the ‘897 patent.

114. By making, using, offering for sale, selling and/or importing into the United States the Accused Instrumentalities, and touting the benefits of using the Accused Instrumentalities’ video compression features, each of Dish, Sling Media, and Arris has injured Realtime and is liable to Realtime for infringement of the ‘897 patent pursuant to 35 U.S.C. § 271.

115. As a result the infringement of the ‘897 patent by each of Dish, Sling Media, and Arris, Plaintiff Realtime is entitled to monetary damages in an amount

adequate to compensate for their infringement, but in no event less than a reasonable royalty for the use made of the invention by each of Dish, Sling Media, and Arris, together with interest and costs as fixed by the Court.

COUNT VI

INFRINGEMENT OF U.S. PATENT NO. 8,867,610

116. Plaintiff Realtime realleges and incorporates by reference paragraphs 1-115 above, as if fully set forth herein.

117. Plaintiff Realtime is the owner by assignment of United States Patent No. 8,867,610 (“the ‘610 Patent”) entitled “System and methods for video and audio data distribution.” The ‘610 Patent was duly and legally issued by the United States Patent and Trademark Office on October 21, 2014. A true and correct copy of the ‘610 Patent is included as Exhibit F.

118. On information and belief, Dish has made, used, offered for sale, sold and/or imported into the United States Dish products and services that infringe the ‘610 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Dish’s streaming video products and services compliant with various versions of the H.264 video compression standard, such as, *e.g.*, the Dish TV service, and all versions and variations thereof since the issuance of the ‘610 patent (“Dish Accused Instrumentalities”). *See,* *e.g.*,

<https://forum.dish.com/viewtopic.php?t=9864&p=58341> (“[S]atellite services (*e.g.*, DirecTV, XstreamHD and Dish Network) utilize the 1080p/24-30 format with MPEG-4 AVC/H.264 encoding for pay-per-view movies that are downloaded in advance via satellite or on-demand via broadband.”); <http://www.satelliteguys.us/xen/threads/hd-bitrate-is-under-5-mb-s-for-most-channels-is-this-correct.256211/> (“For HD video DN exclusively uses H.264 compression (sometimes ambiguously referred to here as MPEG-4, as there is more than one MPEG-4 video compression format). H.264 is about 2X more efficient than MPEG-2 for the same video quality.”).

119. On information and belief, Sling TV has made, used, offered for sale, sold and/or imported into the United States Sling TV products and services that infringe the ‘610 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Sling TV’s streaming video products and services compliant with various versions of the H.264 video compression standard, such as, *e.g.*, the Sling Orange and Sling Blue TV services, and all versions and variations thereof since the issuance of the ‘610 patent (“Sling TV Accused Instrumentalities”). See, *e.g.*, <https://www.sling.com/> (“Sling TV offers two domestic streaming services: The single-stream Sling Orange service and the multi-stream Sling Blue service.”); https://www.reddit.com/r/slingtv/comments/2ynmxx/what_resolutions_are_the_channels_in/ (“OTA broadcasts use MPEG-2, which is far less efficient than the H.264 used by Sling, which needs far less data than MPEG-2 to deliver similar quality.”).

120. On information and belief, Sling Media has made, used, offered for sale, sold and/or imported into the United States Sling Media products and services that infringe the ‘610 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Sling Media’s streaming video products and services compliant with various versions of the H.264 video compression standard, such as, *e.g.*, Slingbox set-top boxes (including, but not limited to, Slingbox 500, Slingbox M2, Slingbox M1, Slingbox 350, and Sling Adapter), and all versions and variations thereof since the issuance of the ‘610 patent (“Accused Instrumentalities”). See, *e.g.*, <http://www.tivocommunity.com/community/index.php?threads/capturing-slingbox-350-500-video.504853/> (“For the newer Slingboxes the video is H.264.”); <https://answers.slingbox.com/thread/3940> (“I have the SlingBox Solo and by all accounts it streams h.264.”)).

121. On information and belief, Arris has made, used, offered for sale, sold and/or imported into the United States Arris products and services that infringe the ‘610 patent, and continues to do so. By way of illustrative example, these infringing products

include, without limitation, Arris's streaming video products and services compliant with various versions of the H.264 video compression standard, such as, *e.g.*, Arris MS4000, and all versions and variations thereof since the issuance of the '897 patent ("Accused Instrumentalities"). *See, e.g.,* <http://www.arris.com/products/media-streamer-ms4000/> ("Transcode to H.264 with adaptive bitrate up to 4 Live/DVR streams").

122. On information and belief, each of Dish, Sling TV, Sling Media, and Arris has directly infringed and continues to infringe the '610 patent, for example, through its own use and testing of the Accused Instrumentalities, which when used, practice the method claimed by Claim 1 of the '610 patent, namely, a method, comprising: determining, a parameter or an attribute of at least a portion of a data block having video or audio data; selecting one or more compression algorithms from among a plurality of compression algorithms to apply to the at least the portion of the data block based upon the determined parameter or attribute and a throughput of a communication channel, at least one of the plurality of compression algorithms being asymmetric; and compressing the at least the portion of the data block with the selected compression algorithm after selecting the one or more compression algorithms.

123. The Dish Accused Instrumentalities determine a parameter of at least a portion of a video data block. Different parameters correspond with, for example, different moment to moment requirements, *e.g.*, the degree of motion of a video data block at any given time. *See, e.g.,* <http://www.satelliteguys.us/xen/threads/hd-bitrate-is-under-5-mb-s-for-most-channels-is-this-correct.256211/> ("Subtracting out the audio data rates, most of the DN HD channels clock in less than 4 Mbit/s for the video stream. However these rates are averages only. DN multiplexes several HD channels per transponder, and **their compressors can dynamically allocate higher or lower rates for each channel based on moment to moment requirements. A static scene on one channel would require far less than a high action scene on another.** Still the data rates do not appear to change drastically and the average rate does appear to be a reasonable

predictor of video quality. Furthermore DN reduces the resolution of a number of their HD channels from 1920x1080 to 1440x1080. This leads to a softer picture more amenable to higher compression.”).

124. The Sling TV Accused Instrumentalities determine a parameter of at least a portion of a video data block, e.g. based on different types of content. <https://www.cuttingcords.com/home/2015/2/9/sling-tv-technical-details> (“First off, I found out that the streams were of differing quality depending on what channel you were watching. Sling has apparently tailored different encoding profiles to different types of content which is nice. ... Below I have listed the encoding profile that each channel is using. As you are probably aware, they are adaptive quality and jump between various qualities depending on how much bandwidth is available at any given time.”).

125. The Sling Media Accused Instrumentalities determine a parameter of at least a portion of a video data block. Different parameters are determined, for example, based on statistics observed by the Slingplayer client. See, e.g., <https://answers.slingbox.com/thread/3940> (“Sling Media believes their programming methodology choses the best encoding parameteres based on the statistics observed by the Slingplayer. You can see the statistics that it uses for the algorithim which dynamically choses the parameters by pressing [Alt]+[Shift]+[i] while connected to the Slingbox.”).

126. The Dish Accused Instrumentalities select one or more compression algorithms to apply to the at least the portion of the data block based upon the determined parameter or attribute and a throughput of a communications channel, at least one of the plurality of compression algorithms being asymmetric. See, e.g., <http://www.satelliteguys.us/xen/threads/hd-bitrate-is-under-5-mb-s-for-most-channels-is-this-correct.256211/> (“Subtracting out the audio data rates, most of the DN HD channels clock in less than 4 Mbit/s for the video stream. However these rates are averages only.

DN multiplexes several HD channels per transponder, and their compressors can dynamically allocate higher or lower rates for each channel based on moment to moment requirements. A static scene on one channel would require far less than a high action scene on another. Still the data rates do not appear to change drastically and the average rate does appear to be a reasonable predictor of video quality. Furthermore DN reduces the resolution of a number of their HD channels from 1920x1080 to 1440x1080. This leads to a softer picture more amenable to higher compression.”).

127. The Sling TV Accused Instrumentalities select one or more compression algorithms to apply to the at least the portion of the data block based upon the determined parameter or attribute and a throughput of a communications channel, at least one of the plurality of compression algorithms being asymmetric. See, e.g., <https://www.cuttingcords.com/home/2015/2/9/sling-tv-technical-details> (“First off, I found out that the streams were of differing quality depending on what channel you were watching. Sling has apparently tailored different encoding profiles to different types of content which is nice. ... Below I have listed the encoding profile that each channel is using. As you are probably aware, they are adaptive quality and jump between various qualities depending on how much bandwidth is available at any given time.”).

128. The Sling Media Accused Instrumentalities select one or more compression algorithms to apply to the at least the portion of the data block based upon the determined parameter or attribute and a throughput of a communications channel, at least one of the plurality of compression algorithms being asymmetric. See, e.g., <https://answers.slingbox.com/thread/3940> (“Sling Media believes their programming methodology choses the best encoding parameters based on the statistics observed by the Slingplayer. You can see the statistics that it uses for the algorithm which dynamically choses the parameters by pressing [Alt]+[Shift]+[i] while connected to the Slingbox.”).

129. Based on a throughput of the communications channel—reflected by the max video bitrate—and resolution parameter identified, any H.264-compliant system such as the Accused Instrumentalities would determine which profile (e.g., “baseline,” “extended,” “main”, or “high”) and/or which “level” within a profile (which corresponds, e.g., to a maximum picture resolution, frame rate, and bit rate) corresponds with that parameter, then select between at least two asymmetric compressors. If, for example, baseline or extended is the corresponding profile, then the system will select a Context-Adaptive Variable Length Coding (“CAVLC”) entropy encoder. If, for example, main or high is the corresponding profile, then the system will select a Context-Adaptive Binary Arithmetic Coding (“CABAC”) entropy encoder. Both encoders are asymmetric compressors because it takes a longer period of time for them to compress data than to decompress data. See <https://sonnati.wordpress.com/2007/10/29/how-h-264-works-part-ii/>

	Baseline	Extended	Main	High	High 10
I and P Slices	Yes	Yes	Yes	Yes	Yes
B Slices	No	Yes	Yes	Yes	Yes
SI and SP Slices	No	Yes	No	No	No
Multiple Reference Frames	Yes	Yes	Yes	Yes	Yes
In-Loop Deblocking Filter	Yes	Yes	Yes	Yes	Yes
CAVLC Entropy Coding	Yes	Yes	Yes	Yes	Yes
CABAC Entropy Coding	No	No	Yes	Yes	Yes
Flexible Macroblock Ordering (FMO)	Yes	Yes	No	No	No
Arbitrary Slice Ordering (ASO)	Yes	Yes	No	No	No
Redundant Slices (RS)	Yes	Yes	No	No	No
Data Partitioning	No	Yes	No	No	No
Interlaced Coding (PicAFF, MBAFF)	No	Yes	Yes	Yes	Yes
4:2:0 Chroma Format	Yes	Yes	Yes	Yes	Yes
Monochrome Video Format (4:0:0)	No	No	No	Yes	Yes
4:2:2 Chroma Format	No	No	No	No	No
4:4:4 Chroma Format	No	No	No	No	No
8 Bit Sample Depth	Yes	Yes	Yes	Yes	Yes
9 and 10 Bit Sample Depth	No	No	No	No	Yes
11 to 14 Bit Sample Depth	No	No	No	No	No
8x8 vs. 4x4 Transform Adaptivity	No	No	No	Yes	Yes
Quantization Scaling Matrices	No	No	No	Yes	Yes
Separate Cb and Cr QP control	No	No	No	Yes	Yes
Separate Color Plane Coding	No	No	No	No	No
Predictive Lossless Coding	No	No	No	No	No

See http://web.cs.ucla.edu/classes/fall03/cs218/paper/H.264_MPEG4_Tutorial.pdf

at 7:

The following table summarizes the two major types of entropy coding: Variable Length Coding (VLC) and Context Adaptive Binary Arithmetic Coding (CABAC). CABAC offers superior coding efficiency over VLC by adapting to the changing probability distribution of symbols, by exploiting correlation between symbols, and by adaptively exploiting bit correlations using arithmetic coding. H.264 also supports Context Adaptive Variable Length Coding (CAVLC) which offers superior entropy coding over VLC without the full cost of CABAC.

H.264 Entropy Coding – Comparison of Approaches

Characteristics	Variable Length Coding (VLC)	Context Adaptive Binary Arithmetic Coding(CABAC)
• Where it is used	MPEG-2, MPEG-4 ASP	H.264/MPEG-4 AVC (high efficiency option)
• Probability distribution	Static - Probabilities never change	Adaptive - Adjusts probabilities based on actual data
• Leverages correlation between symbols	No - Conditional probabilities ignored	Yes - Exploits symbol correlations by using "contexts"
• Non-integer code words	No - Low coding efficiency for high probability symbols	Yes - Exploits "arithmetic coding" which generates non-integer code words for higher efficiency

Moreover, the H.264 Standard requires a bit-flag descriptor, which is set to determine the correct decoder for the corresponding encoder. As shown below, if the flag = 0, then CAVLC must have been selected as the encoder; if the flag = 1, then CABAC must have been selected as the encoder. See

https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-H.264-201304-S!!PDF-E&type=items (Rec. ITU-T H.264 (04/2013)) at 80:

entropy_coding_mode_flag selects the entropy decoding method to be applied for the syntax elements for which two descriptors appear in the syntax tables as follows:

- If **entropy_coding_mode_flag** is equal to 0, the method specified by the left descriptor in the syntax table is applied (Exp-Golomb coded, see clause 9.1 or CAVLC, see clause 9.2).
- Otherwise (**entropy_coding_mode_flag** is equal to 1), the method specified by the right descriptor in the syntax table is applied (CABAC, see clause 9.3).

130. The Accused Instrumentalities compress the at least the portion of the data block with the selected compression algorithm after selecting the one or more,

compression algorithms. After its selection, the asymmetric compressor (CAVLC or CABAC) will compress the video data, in accordance with the specifications of the profile and level selected, to provide various compressed data blocks. See <https://sonnati.wordpress.com/2007/10/29/how-h-264-works-part-ii/>:

Entropy Coding

For entropy coding, H.264 may use an enhanced VLC, a more complex context-adaptive variable-length coding (CAVLC) or an ever more complex Context-adaptive binary-arithmetic coding (CABAC) which are complex techniques to losslessly compress syntax elements in the video stream knowing the probabilities of syntax elements in a given context. The use of CABAC can improve the compression of around 5-7%. CABAC may require a 30-40% of total processing power to be accomplished.

See

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.602.1581&rep=rep1&type=pdf>

at 13:

Typical compression ratios to maintain excellent quality are:

- 10:1 for general images using JPEG
- 30:1 for general video using H.263 and MPEG-2
- 60:1 for general video using H.264 and WMV9

131. On information and belief, Dish, Sling TV, and Sling Media also directly infringe and continue to infringe other claims of the ‘610 patent, for similar reasons as explained above with respect to Claim 1 of the ‘610 patent.

132. On information and belief, use of the Accused Instrumentalities in their ordinary and customary fashion results in infringement of the methods claimed by the ‘610 patent.

133. On information and belief, Dish, Sling TV, and Sling Media have had knowledge of the ‘610 patent since at least the filing of this Complaint or shortly thereafter, and on information and belief, Dish, Sling TV, and Sling Media knew of the ‘610 patent and knew of their infringement, including by way of this lawsuit.

134. Upon information and belief, the affirmative acts of each of Dish, Sling Media, and Arris of making, using, and selling the Accused Instrumentalities, and

providing implementation services and technical support to users of the Accused Instrumentalities, have induced since the filing of this Amended Complaint and continue to induce users of the Accused Instrumentalities to use them in their normal and customary way to infringe the ‘610 patent by practicing a method, comprising: determining, a parameter or an attribute of at least a portion of a data block having video or audio data; selecting one or more compression algorithms from among a plurality of compression algorithms to apply to the at least the portion of the data block based upon the determined parameter or attribute and a throughput of a communication channel, at least one of the plurality of compression algorithms being asymmetric; and compressing the at least the portion of the data block with the selected compression algorithm after selecting the one or more, compression algorithms. For example, Dish instructs customers (e.g., of the Hopper with Sling) that they can, “Watch Live TV: Live sporting events, weather, news, and more – with a broadband-connected, Sling-enabled DVR and DISH Anywhere, you can watch all of your favorite channels anywhere you go! Watch Recorded TV: Access recorded shows from your broadband-connected, Sling-enabled DVR anywhere. You can even start watching on your TV and resume watching later on your computer or mobile device!”. See, e.g., <https://www.mydish.com/dish-anywhere>. For example, Sling Media instructs customers that “Sling Media believes their programming methodology chooses the best encoding parameters based on the statistics observed by the Slingplayer. You can see the statistics that it uses for the algorithm which dynamically chooses the parameters” <https://answers.slingbox.com/thread/3940>. For example, Arris instructs its customers that the MS4000 can “[t]ranscode to H.264 with adaptive bitrate up to 4 Live/DVR streams”. See, e.g., https://www.arris.com/globalassets/resources/data-sheets/365-095-24637_ms4000.pdf. For similar reasons, each of Dish, Sling Media, and Arris also induces its customers to use the Accused Instrumentalities to infringe other claims of the ‘610 patent. Each of Dish, Sling Media, and Arris specifically intended and was aware that these normal and

customary activities would infringe the ‘610 patent. Each of Dish, Sling Media, and Arris performed the acts that constitute induced infringement, and would induce actual infringement, with the knowledge of the ‘610 patent and with the knowledge, or willful blindness to the probability, that the induced acts would constitute infringement. On information and belief, each of Dish, Sling Media, and Arris engaged in such inducement to promote the sales of the Accused Instrumentalities. Accordingly, each of Dish, Sling Media, and Arris has induced and continue to induce users of the Accused Instrumentalities to use the Accused Instrumentalities in their ordinary and customary way to infringe the ‘610 patent, knowing that such use constitutes infringement of the ‘610 patent.

135. By making, using, offering for sale, selling and/or importing into the United States the Accused Instrumentalities, and touting the benefits of using the Accused Instrumentalities’ compression features, each of Dish, Sling TV, Sling Media, and Arris has injured Realtime and is liable to Realtime for infringement of the ‘610 patent pursuant to 35 U.S.C. § 271.

136. As a result of the infringement of the ‘610 patent by Dish, Sling TV, Sling Media, and Arris, Plaintiff Realtime is entitled to monetary damages in an amount adequate to compensate for Dish, Sling TV, Sling Media, and Arris’s infringement, but in no event less than a reasonable royalty for the use made of the invention by Dish, Sling TV, Sling Media, and Arris, together with interest and costs as fixed by the Court.

COUNT VII

INFRINGEMENT OF U.S. PATENT NO. 8,934,535

137. Plaintiff realleges and incorporates by reference paragraphs 1-136 above, as if fully set forth herein.

138. Plaintiff Realtime is the owner by assignment of United States Patent No. 8,934,535 (“the ‘535 patent”) entitled “Systems and methods for video and audio data

storage and distribution.” The ‘535 patent was duly and legally issued by the United States Patent and Trademark Office on January 13, 2015. A true and correct copy of the ‘535 patent is included as Exhibit G.

139. On information and belief, Dish has made, used, offered for sale, sold and/or imported into the United States Dish products and services that infringe the ‘535 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Dish’s streaming video products and services compliant with various versions of the H.264 video compression standard, such as, *e.g.*, the Dish TV service, and all versions and variations thereof since the issuance of the ‘535 patent (“Dish Accused Instrumentalities”). *See, e.g.*,

<https://forum.dish.com/viewtopic.php?t=9864&p=58341> (“[S]atellite services (*e.g.*, DirecTV, XstreamHD and Dish Network) utilize the 1080p/24-30 format with MPEG-4 AVC/H.264 encoding for pay-per-view movies that are downloaded in advance via satellite or on-demand via broadband.”); <http://www.satelliteguys.us/xen/threads/hd-bitrate-is-under-5-mb-s-for-most-channels-is-this-correct.256211/> (“For HD video DN exclusively uses H.264 compression (sometimes ambiguously referred to here as MPEG-4, as there is more than one MPEG-4 video compression format). H.264 is about 2X more efficient than MPEG-2 for the same video quality.”).

140. On information and belief, Sling TV has made, used, offered for sale, sold and/or imported into the United States Sling TV products and services that infringe the ‘535 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Sling TV’s streaming video products and services compliant with various versions of the H.264 video compression standard, such as, *e.g.*, the Sling Orange and Sling Blue TV services, and all versions and variations thereof since the issuance of the ‘535 patent (“Sling TV Accused Instrumentalities”). *See, e.g.*, <https://www.sling.com/> (“Sling TV offers two domestic streaming services: The single-stream Sling Orange service and the multi-stream Sling Blue service.”);

https://www.reddit.com/r/slingtv/comments/2ynmxx/what_resolutions_are_the_channels_in/ (“OTA broadcasts use MPEG-2, which is far less efficient than the H.264 used by Sling, which needs far less data than MPEG-2 to deliver similar quality.”).

141. On information and belief, Sling Media has made, used, offered for sale, sold and/or imported into the United States Sling Media products and services that infringe the ‘535 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Sling Media’s streaming video products and services compliant with various versions of the H.264 video compression standard, such as, *e.g.*, Slingbox set-top boxes (including, but not limited to, Slingbox 500, Slingbox M2, Slingbox M1, Slingbox 350, and Sling Adapter), and all versions and variations thereof since the issuance of the ‘535 patent (“Accused Instrumentalities”). *See, e.g.*, <http://www.tivocommunity.com/community/index.php?threads/capturing-slingbox-350-500-video.504853/> (“For the newer Slingboxes the video is H.264.”); <https://answers.slingbox.com/thread/3940> (“I have the SlingBox Solo and by all accounts it streams h.264.”).

142. On information and belief, Arris has made, used, offered for sale, sold and/or imported into the United States Arris products and services that infringe the ‘535 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Arris’s streaming video products and services compliant with various versions of the H.264 video compression standard, such as, *e.g.*, Arris MS4000, and all versions and variations thereof since the issuance of the ‘897 patent (“Accused Instrumentalities”). *See, e.g.*, <http://www.arris.com/products/media-streamer-ms4000/> (“Transcode to H.264 with adaptive bitrate up to 4 Live/DVR streams”).

143. On information and belief, each of Dish, Sling TV, Sling Media, and Arris has directly infringed and continues to infringe the ‘535 patent, for example, through its own use and testing of the Accused Instrumentalities, which when used, practices the methods claimed by at least Claim 15 of the ‘535 patent, including a method, comprising:

determining a parameter of at least a portion of a data block; selecting one or more asymmetric compressors from among a plurality of compressors based upon the determined parameter or attribute; compressing the at least the portion of the data block with the selected one or more asymmetric compressors to provide one or more compressed data blocks; and storing at least a portion of the one or more compressed data blocks. Upon information and belief, each of Dish, Sling TV, Sling Media, and Arris uses the Accused Instrumentalities to practice infringing methods for their own internal non-testing business purposes, while testing the Accused Instrumentalities, and while providing technical support and repair services for the Accused Instrumentalities to each of Dish, Sling TV, Sling Media, and Arris customers.

144. The Dish Accused Instrumentalities determine a parameter of at least a portion of a video data block. Different parameters correspond with, for example, different moment to moment requirements, e.g., the degree of motion of a video data block at any given time. See, e.g., <http://www.satelliteguys.us/xen/threads/hd-bitrate-is-under-5-mb-s-for-most-channels-is-this-correct.256211/> (“Subtracting out the audio data rates, most of the DN HD channels clock in less than 4 Mbit/s for the video stream. However these rates are averages only. DN multiplexes several HD channels per transponder, and **their compressors can dynamically allocate higher or lower rates for each channel based on moment to moment requirements. A static scene on one channel would require far less than a high action scene on another.** Still the data rates do not appear to change drastically and the average rate does appear to be a reasonable predictor of video quality. **Furthermore DN reduces the resolution of a number of their HD channels from 1920x1080 to 1440x1080.** This leads to a softer picture more amenable to higher compression.”).

145. The Sling TV Accused Instrumentalities determine a parameter of at least a portion of a video data block, e.g. based on different types of content. <https://www.cuttingcords.com/home/2015/2/9/sling-tv-technical-details> (“First off, I

found out that the streams were of differing quality depending on what channel you were watching. Sling has apparently **tailored different encoding profiles to different types of content** which is nice. ... Below I have listed the encoding profile that each channel is using. As you are probably aware, **they are adaptive quality and jump between various qualities depending on how much bandwidth is available at any given time.”**.

146. The Sling Media Accused Instrumentalities determine a parameter of at least a portion of a video data block. Different parameters are determined, for example, based on statistics observed by the Slingplayer client. See, e.g., <https://answers.slingbox.com/thread/3940> (“Sling Media believes their programming methodology choses the best encoding parameteres based on the statistics observed by the Slingplayer. You can see the statistics that it uses for the algorithim which dynamically choses the parameters by pressing [Alt]+[Shift]+[i] while connected to the Slingbox.”).

147. As, for example, explained above, the Accused Instrumentalities determine a parameter of at least a portion of a video data block. As shown below, examples of such parameters include bitrate (or max video bitrate) and resolution parameters. Different parameters correspond with different end applications. H.264 provides for multiple different ranges of such parameters, each included in the “profiles” and “levels” defined by the H.264 standard. See http://www.axis.com/files/whitepaper/wp_h264_31669_en_0803_lo.pdf at 5:

4. H.264 profiles and levels

The joint group involved in defining H.264 focused on creating a simple and clean solution, limiting options and features to a minimum. An important aspect of the standard, as with other video standards, is providing the capabilities in profiles (sets of algorithmic features) and levels (performance classes) that optimally support popular productions and common formats.

H.264 has seven profiles, each targeting a specific class of applications. Each profile defines what feature set the encoder may use and limits the decoder implementation complexity.

Network cameras and video encoders will most likely use a profile called the baseline profile, which is intended primarily for applications with limited computing resources. The baseline profile is the most suitable given the available performance in a real-time encoder that is embedded in a network video product. The profile also enables low latency, which is an important requirement of surveillance video and also particularly important in enabling real-time, pan/tilt/zoom (PTZ) control in PTZ network cameras.

H.264 has 11 levels or degree of capability to limit performance, bandwidth and memory requirements. Each level defines the bit rate and the encoding rate in macroblock per second for resolutions ranging from QCIF to HDTV and beyond. The higher the resolution, the higher the level required.

See https://en.wikipedia.org/wiki/H.264/MPEG-4_AVC:

Level	Levels with maximum property values							Examples for high resolution @ highest frame rate (max stored frames) <small>Toggle additional details</small>	
	Max decoding speed		Max frame size		Max video bit rate for video coding layer (VCL) kbit/s				
	Luma samples/s	Macroblocks/s	Luma samples	Macroblocks	Baseline, Extended and Main Profiles	High Profile	High 10 Profile		
1	380,160	1,485	25,344	99	64	80	192	176x144@15.0 (4)	
1b	380,160	1,485	25,344	99	128	160	384	176x144@15.0 (4)	
1.1	768,000	3,000	101,376	396	192	240	576	352x288@7.5 (2)	
1.2	1,536,000	6,000	101,376	396	384	480	1,152	352x288@15.2 (6)	
1.3	3,041,280	11,880	101,376	396	768	960	2,304	352x288@30.0 (6)	
2	3,041,280	11,880	101,376	396	2,000	2,500	6,000	352x288@30.0 (6)	
2.1	5,068,800	19,800	202,752	792	4,000	5,000	12,000	352x576@25.0 (6)	
2.2	5,184,000	20,250	414,720	1,620	4,000	5,000	12,000	720x576@12.5 (5)	
3	10,368,000	40,500	414,720	1,620	10,000	12,500	30,000	720x576@25.0 (5)	
3.1	27,648,000	108,000	921,600	3,600	14,000	17,500	42,000	1,280x720@30.0 (5)	
3.2	55,296,000	216,000	1,310,720	5,120	20,000	25,000	60,000	1,280x1,024@42.2 (4)	
4	62,914,560	245,760	2,097,152	8,192	20,000	25,000	60,000	2,048x1,024@30.0 (4)	
4.1	62,914,560	245,760	2,097,152	8,192	50,000	62,500	150,000	2,048x1,024@30.0 (4)	
4.2	133,693,440	522,240	2,228,224	8,704	50,000	62,500	150,000	2,048x1,080@60.0 (4)	
5	150,994,944	589,824	5,652,480	22,080	135,000	168,750	405,000	3,672x1,536@26.7 (5)	
5.1	251,658,240	983,040	9,437,184	36,864	240,000	300,000	720,000	4,096x2,304@26.7 (5)	
5.2	530,841,600	2,073,600	9,437,184	36,864	240,000	300,000	720,000	4,096x2,304@56.3 (5)	

148. The Dish Accused Instrumentalities select one or more compression algorithms to apply to at least the portion of the data block based upon the determined parameter or attribute and a throughput of a communications channel, at least one of the plurality of compression algorithms being asymmetric. See, e.g., <http://www.satelliteguys.us/xen/threads/hd-bitrate-is-under-5-mb-s-for-most-channels-is->

[this-correct.256211/](#) (“Subtracting out the audio data rates, most of the DN HD channels clock in less than 4 Mbit/s for the video stream. However these rates are averages only. DN multiplexes several HD channels per transponder, and their compressors can dynamically allocate higher or lower rates for each channel based on moment to moment requirements. A static scene on one channel would require far less than a high action scene on another. Still the data rates do not appear to change drastically and the average rate does appear to be a reasonable predictor of video quality. Furthermore DN reduces the resolution of a number of their HD channels from 1920x1080 to 1440x1080. This leads to a softer picture more amenable to higher compression.”).

149. The Sling TV Accused Instrumentalities select one or more compression algorithms to apply to the at least the portion of the data block based upon the determined parameter or attribute and a throughput of a communications channel, at least one of the plurality of compression algorithms being asymmetric. See, e.g., <https://www.cuttingcords.com/home/2015/2/9/sling-tv-technical-details> (“First off, I found out that the streams were of differing quality depending on what channel you were watching. Sling has apparently tailored different encoding profiles to different types of content which is nice. ... Below I have listed the encoding profile that each channel is using. As you are probably aware, they are adaptive quality and jump between various qualities depending on how much bandwidth is available at any given time.”).

150. The Sling Media Accused Instrumentalities select one or more compression algorithms to apply to the at least the portion of the data block based upon the determined parameter or attribute and a throughput of a communications channel, at least one of the plurality of compression algorithms being asymmetric. See, e.g., <https://answers.slingbox.com/thread/3940> (“Sling Media believes their programming methodology choses the best encoding parameters based on the statistics observed by the Slingplayer. You can see the statistics that it uses for the algorithm which

dynamically chooses the parameters by pressing [Alt]+[Shift]+[i] while connected to the Slingbox.”).

151. Based on a throughput of the communications channel—reflected by the max video bitrate—and resolution parameter identified, any H.264-compliant system such as the Accused Instrumentalities would determine which profile (e.g., “baseline,” “extended,” “main”, or “high”) corresponds with that parameter, then select between at least two asymmetric compressors. If baseline or extended is the corresponding profile, then the system will select a Context-Adaptive Variable Length Coding (“CAVLC”) entropy encoder. If main or high is the corresponding profile, then the system will select a Context-Adaptive Binary Arithmetic Coding (“CABAC”) entropy encoder. Both encoders are asymmetric compressors because it takes a longer period of time for them to compress data than to decompress data. See

<https://sonnati.wordpress.com/2007/10/29/how-h-264-works-part-ii/>

	Baseline	Extended	Main	High	High 10
I and P Slices	Yes	Yes	Yes	Yes	Yes
B Slices	No	Yes	Yes	Yes	Yes
SI and SP Slices	No	Yes	No	No	No
Multiple Reference Frames	Yes	Yes	Yes	Yes	Yes
In-Loop Deblocking Filter	Yes	Yes	Yes	Yes	Yes
CAVLC Entropy Coding	Yes	Yes	Yes	Yes	Yes
CABAC Entropy Coding	No	No	Yes	Yes	Yes
Flexible Macroblock Ordering (FMO)	Yes	Yes	No	No	No
Arbitrary Slice Ordering (ASO)	Yes	Yes	No	No	No
Redundant Slices (RS)	Yes	Yes	No	No	No
Data Partitioning	No	Yes	No	No	No
Interlaced Coding (PicAFF, MBAFF)	No	Yes	Yes	Yes	Yes
4:2:0 Chroma Format	Yes	Yes	Yes	Yes	Yes
Monochrome Video Format (4:0:0)	No	No	No	Yes	Yes
4:2:2 Chroma Format	No	No	No	No	No
4:4:4 Chroma Format	No	No	No	No	No
8 Bit Sample Depth	Yes	Yes	Yes	Yes	Yes
9 and 10 Bit Sample Depth	No	No	No	No	Yes
11 to 14 Bit Sample Depth	No	No	No	No	No
8x8 vs. 4x4 Transform Adaptivity	No	No	No	Yes	Yes
Quantization Scaling Matrices	No	No	No	Yes	Yes
Separate Cb and Cr QP control	No	No	No	Yes	Yes
Separate Color Plane Coding	No	No	No	No	No
Predictive Lossless Coding	No	No	No	No	No

See

http://web.cs.ucla.edu/classes/fall03/cs218/paper/H.264_MPEG4_Tutorial.pdf at 7:

The following table summarizes the two major types of entropy coding: Variable Length Coding (VLC) and Context Adaptive Binary Arithmetic Coding (CABAC). CABAC offers superior coding efficiency over VLC by adapting to the changing probability distribution of symbols, by exploiting correlation between symbols, and by adaptively exploiting bit correlations using arithmetic coding. H.264 also supports Context Adaptive Variable Length Coding (CAVLC) which offers superior entropy coding over VLC without the full cost of CABAC.

H.264 Entropy Coding – Comparison of Approaches

Characteristics	Variable Length Coding (VLC)	Context Adaptive Binary Arithmetic Coding(CABAC)
• Where it is used	MPEG-2, MPEG-4 ASP	H.264/MPEG-4 AVC (high efficiency option)
• Probability distribution	Static - Probabilities never change	Adaptive - Adjusts probabilities based on actual data
• Leverages correlation between symbols	No - Conditional probabilities ignored	Yes - Exploits symbol correlations by using "contexts"
• Non-integer code words	No - Low coding efficiency for high probability symbols	Yes - Exploits "arithmetic coding" which generates non-integer code words for higher efficiency

Moreover, the H.264 Standard requires a bit-flag descriptor, which is set to determine the correct decoder for the corresponding encoder. As shown below, if the flag = 0, then CAVLC must have been selected as the encoder; if the flag = 1, then CABAC must have been selected as the encoder. See https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-H.264-201304-S!!PDF-E&type=items (Rec. ITU-T H.264 (04/2013)) at 80:

entropy_coding_mode_flag selects the entropy decoding method to be applied for the syntax elements for which two descriptors appear in the syntax tables as follows:

- If **entropy_coding_mode_flag** is equal to 0, the method specified by the left descriptor in the syntax table is applied (Exp-Golomb coded, see clause 9.1 or CAVLC, see clause 9.2).
- Otherwise (**entropy_coding_mode_flag** is equal to 1), the method specified by the right descriptor in the syntax table is applied (CABAC, see clause 9.3).

152. The Accused Instrumentalities compress the at least the portion of the data block with the selected one or more asymmetric compressors to provide one or more compressed data blocks. After its selection, the asymmetric compressor (CAVLC or CABAC) will compress the video data to provide various compressed data blocks. See <https://sonnati.wordpress.com/2007/10/29/how-h-264-works-part-ii/>:

Entropy Coding

For entropy coding, H.264 may use an enhanced VLC, a more complex context-adaptive variable-length coding (CAVLC) or an ever more complex Context-adaptive binary-arithmetic coding (CABAC) which are complex techniques to losslessly compress syntax elements in the video stream knowing the probabilities of syntax elements in a given context. The use of CABAC can improve the compression of around 5-7%. CABAC may require a 30-40% of total processing power to be accomplished.

See

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.602.1581&rep=rep1&type=pdf>

at 13:

Typical compression ratios to maintain excellent quality are:

- 10:1 for general images using JPEG
- 30:1 for general video using H.263 and MPEG-2
- 60:1 for general video using H.264 and WMV9

See http://www.ijera.com/papers/Vol3_issue4/BM34399403.pdf at 2:

Most visual communication systems today use Baseline Profile. Baseline is the simplest H.264 profile and defines, for example, zigzag scanning of the picture and using 4:2:0 (YUV video formats) chrominance sampling. In Baseline Profile, the picture is split in blocks consisting of 4x4 pixels, and each block is processed separately. Another important element of the Baseline Profile is the use of Universal Variable Length Coding (UVLC) and Context Adaptive Variable Length Coding (CAVLC) entropy coding techniques.

The Extended and Main Profiles includes the functionality of the Baseline Profile and add improvements to the predictions algorithms. Since transmitting every single frame (think 30 frames per second for good quality video) is not feasible if you are trying to reduce the bit rate 1000-2000 times, temporal and motion prediction are heavily used in H.264, and allow transmitting only the difference between one frame and the previous frames. The result is spectacular efficiency gain, especially for scenes with little change and motion.

The High Profile is the most powerful profile in H.264, and it allows most efficient coding of video. For example, large coding gain achieved through the use of Context Adaptive Binary Arithmetic Coding (CABAC) encoding which is more efficient than the UVLC/CAVLC used in Baseline Profile.

The High Profile also uses adaptive transform that decides on the fly if 4x4 or 8x8-pixel blocks should be used. For example, 4x4 blocks are used for the parts of the picture that are dense with detail, while parts that have little detail are transformed using 8x8 blocks.

153. On information and belief, the Accused Instrumentalities store at least a portion of the one or more compressed data blocks in buffers, hard disk, or other forms of memory/storage.

154. On information and belief, Dish, Sling TV, and Sling Media also directly infringe and continue to infringe other claims of the ‘535 patent, for similar reasons as explained above with respect to Claim 15 of the ‘535 patent.

155. On information and belief, use of the Accused Instrumentalities in their

ordinary and customary fashion results in infringement of the methods claimed by the ‘535 patent.

156. On information and belief, Dish, Sling TV, and Sling Media have had knowledge of the ‘535 patent since at least the filing of this Complaint or shortly thereafter, and on information and belief, Dish, Sling TV, and Sling Media knew of the ‘535 patent and knew of their infringement, including by way of this lawsuit.

157. Upon information and belief, the affirmative acts of each of Dish, Sling Media, and Arris of making, using, and selling the Accused Instrumentalities, and providing implementation services and technical support to users of the Accused Instrumentalities, have induced since the filing of this Amended Complaint and continue to induce users of the Accused Instrumentalities to use them in their normal and customary way to infringe the ‘535 patent by practicing a method, comprising: determining a parameter of at least a portion of a data block; selecting one or more asymmetric compressors from among a plurality of compressors based upon the determined parameter or attribute; compressing the at least the portion of the data block with the selected one or more asymmetric compressors to provide one or more compressed data blocks; and storing at least a portion of the one or more compressed data blocks. For example, Dish instructs customers (e.g., of the Hopper with Sling) that they can, “Watch Live TV: Live sporting events, weather, news, and more – with a broadband-connected, Sling-enabled DVR and DISH Anywhere, you can watch all of your favorite channels anywhere you go! Watch Recorded TV: Access recorded shows from your broadband-connected, Sling-enabled DVR anywhere. You can even start watching on your TV and resume watching later on your computer or mobile device!”. See, e.g., <https://www.mydish.com/dish-anywhere>. For example, Sling Media instructs customers that “Sling Media believes their programming methodology chooses the best encoding parameters based on the statistics observed by the Slingplayer. You can see the statistics that it uses for the algorithm which dynamically chooses the parameters”

<https://answers.slingbox.com/thread/3940>. For example, Arris instructs its customers that the MS4000 can “[t]ranscode to H.264 with adaptive bitrate up to 4 Live/DVR streams”. See, e.g., https://www.arris.com/globalassets/resources/data-sheets/365-095-24637_ms4000.pdf. For similar reasons, each of Dish, Sling Media, and Arris also induces its customers to use the Accused Instrumentalities to infringe other claims of the ‘535 patent. Each of Dish, Sling Media, and Arris specifically intended and was aware that these normal and customary activities would infringe the ‘535 patent. Each of Dish, Sling Media, and Arris performed the acts that constitute induced infringement, and would induce actual infringement, with the knowledge of the ‘535 patent and with the knowledge, or willful blindness to the probability, that the induced acts would constitute infringement. On information and belief, each of Dish, Sling Media, and Arris engaged in such inducement to promote the sales of the Accused Instrumentalities. Accordingly, each of Dish, Sling Media, and Arris has induced and continue to induce users of the Accused Instrumentalities to use the Accused Instrumentalities in their ordinary and customary way to infringe the ‘535 patent, knowing that such use constitutes infringement of the ‘535 patent.

158. By making, using, offering for sale, selling and/or importing into the United States the Accused Instrumentalities, and touting the benefits of using the Accused Instrumentalities’ compression features, each of Dish, Sling TV, Sling Media, and Arris has injured Realtime and is liable to Realtime for infringement of the ‘535 patent pursuant to 35 U.S.C. § 271.

159. As a result of the infringement of the ‘535 patent by Dish, Sling TV, Sling Media, and Arris, Plaintiff Realtime is entitled to monetary damages in an amount adequate to compensate for Dish, Sling TV, Sling Media, and Arris’s infringement, but in no event less than a reasonable royalty for the use made of the invention by Dish, Sling TV, Sling Media, and Arris, together with interest and costs as fixed by the Court.

COUNT VIII
INFRINGEMENT OF U.S. PATENT NO. 8,553,759

160. Plaintiff realleges and incorporates by reference paragraphs 1-159 above, as if fully set forth herein.

161. Plaintiff Realtime is the owner by assignment of United States Patent No. 8,553,759 (“the ‘759 patent”) entitled “Bandwidth sensitive data compression and decompression.” The ‘759 patent was duly and legally issued by the United States Patent and Trademark Office on October 8, 2013. A true and correct copy of the ‘759 patent is included as Exhibit H.

162. On information and belief, EchoStar Corporation, EchoStar Technologies L.L.C., and Hughes Network Systems LLC (collectively, “Defendants”) have offered for sale, sold and/or imported into the United States products that infringe the ‘759 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Defendants’ products and services, such as HN/HX Systems, and all versions and variations thereof since the issuance of the ‘759 patent (“Accused Instrumentality”).

163. On information and belief, Defendants have directly infringed and continue to infringe the ‘759 patent, for example, through their own use and testing of the accused products to practice compression methods claimed by the ‘759 patent, including a method comprising: compressing data using a compression routine providing a first compression rate; tracking throughput of a data processing system to determine if the first compression rate provides a throughput that meets a predetermined throughput threshold; and if the tracked throughput does not meet the predetermined throughput threshold, compressing data using a compression routine providing a second compression rate that is different from the first compression rate, to change the throughput of the data processing system. On information and belief, Defendants use the Accused Instrumentality in its ordinary and customary fashion for their own internal non-testing

business purposes, while testing the Accused Instrumentality, and while providing technical support and repair services for the Accused Instrumentality to Defendants' customers, and use of the Accused Instrumentality in its ordinary and customary fashion results in infringement of the methods claimed by the '759 patent.

164. Defendants' affirmative acts of making, using, selling, offering for sale, and/or importing the Accused Instrumentality since the filing of this Amended Complaint and continue to induce users of the Accused Instrumentality to use the Accused Instrumentality in its normal and customary way to infringe the '759 patent by practicing compression methods claimed by the '759 patent, including a method comprising: compressing data using a compression routine providing a first compression rate; tracking throughput of a data processing system to determine if the first compression rate provides a throughput that meets a predetermined throughput threshold; and if the tracked throughput does not meet the predetermined throughput threshold, compressing data using a compression routine providing a second compression rate that is different from the first compression rate, to change the throughput of the data processing system. For example, Defendants explain to customers the benefits of using the Accused Instrumentality, "Should the remote terminal need even more robust link performance for the inbound transmissions, it also has the ability to gear shift to a different inroute group supporting a lower symbol rate. These availability features, together with the DVB-S2 ACM capability, result in unparalleled link performance that is critical for any business application." See, e.g., <http://europe.hughes.com/resources/hn9000/download>. Defendants specifically intended and were aware that the normal and customary use of the Accused Instrumentality would infringe the '759 patent. Defendants performed the acts that constitute induced infringement, and would induce actual infringement, with the knowledge of the '759 patent and with the knowledge, or willful blindness to the probability, that the induced acts would constitute infringement. On information and belief, Defendants engaged in such inducement to promote the sales of the Accused

Instrumentality, *e.g.*, through Defendants' user manuals, product support, marketing materials, and training materials to actively induce the users of the Accused Instrumentality to infringe the '759 patent. Accordingly, Defendants have induced since the filing of this Amended Complaint and continue to induce users of the Accused Instrumentality to use the Accused Instrumentality in its ordinary and customary way to infringe the '759 patent, knowing that such use constitutes infringement of the '759 patent.

165. The Accused Instrumentality practices a method comprising: compressing data using a compression routine providing a first compression rate. For example, the remote terminals at beam center can be configured for the most bandwidth efficient coding/modulation combination (8 PSK Rate 9/10). See, *e.g.*, <http://europe.hughes.com/resources/hn9000/download> at 2.

166. The Accused Instrumentality practices a method comprising: tracking throughput of a data processing system to determine if the first compression rate provides a throughput that meets a predetermined throughput threshold. For example, "ACM allows the system to vary dynamically the modulation and coding of the outbound channel for each transmission. This feature can be applied in two ways—first to optimize the link budget of the outbound channel and second to make dynamic adjustments to compensate for atmospheric attenuation of the outbound channel. ... Should the remote terminal need even more robust link performance for the inbound transmissions, it also has the ability to gear shift to a different inroute group supporting a lower symbol rate. These availability features, together with the DVB-S2 ACM capability, result in unparalleled link performance that is critical for any business application." See, *e.g.*, <http://europe.hughes.com/resources/hn9000/download>.

167. If the tracked throughput does not meet the predetermined throughput threshold, the Accused Instrumentality compresses data using a compression routine providing a second compression rate that is different from the first compression rate, to

change the throughput of the data processing system. For example, “ACM allows the system to vary dynamically the modulation and coding of the outbound channel for each transmission. This feature can be applied in two ways—first to optimize the link budget of the outbound channel and second to make dynamic adjustments to compensate for atmospheric attenuation of the outbound channel. ... Should the remote terminal need even more robust link performance for the inbound transmissions, it also has the ability to gear shift to a different inroute group supporting a lower symbol rate. These availability features, together with the DVB-S2 ACM capability, result in unparalleled link performance that is critical for any business application.” See, e.g., <http://europe.hughes.com/resources/hn9000/download>.

168. Defendants also infringe other claims of the ‘759 patent, directly and through inducing infringement, for similar reasons as explained above with respect to Claim 1 of the ‘759 patent.

169. By making, using, offering for sale, selling and/or importing into the United States the Accused Instrumentality, and touting the benefits of using the Accused Instrumentality’s compression features, Defendants have injured Realtime and are liable to Realtime for infringement of the ‘759 patent pursuant to 35 U.S.C. § 271.

170. As a result of Defendants’ infringement of the ‘759 patent, Plaintiff Realtime is entitled to monetary damages in an amount adequate to compensate for Defendants’ infringement, but in no event less than a reasonable royalty for the use made of the invention by Defendants, together with interest and costs as fixed by the Court.

PRAYER FOR RELIEF

WHEREFORE, Plaintiff Realtime respectfully requests that this Court enter:

a. A judgment in favor of Plaintiff that Defendants have infringed, either literally and/or under the doctrine of equivalents, the ‘204 patent, the ‘728 patent, the ‘867 patent, the ‘707 patent, the ‘897 patent, the ‘610 patent, the ‘535 patent, and the

‘759 patent;

- b. A permanent injunction prohibiting Defendants from further acts of infringement of the ‘204 patent, the ‘728 patent, the ‘867 patent, the ‘707 patent, the ‘897 patent, the ‘610 patent, the ‘535 patent, and the ‘759 patent;
- c. A judgment and order requiring Defendants to pay Plaintiff its damages, costs, expenses, and prejudgment and post-judgment interest for Defendants’ infringement of the ‘204 patent, the ‘728 patent, the ‘867 patent, the ‘707 patent, the ‘897 patent, the ‘610 patent, the ‘535 patent, and the ‘759 patent, as provided under 35 U.S.C. § 284; and
- d. A judgment and order requiring Defendants to provide an accounting and to pay supplemental damages to Realtime, including without limitation, prejudgment and post-judgment interest;
- e. That the damages for Defendants’ infringement be increased under 35 U.S.C. § 284 to three times the amount found or assessed;
- f. A judgment and order finding that this is an exceptional case within the meaning of 35 U.S.C. § 285 and awarding to Plaintiff its reasonable attorneys’ fees against Defendants; and
- g. Any and all other relief as the Court may deem appropriate and just under the circumstances.

DEMAND FOR JURY TRIAL

Plaintiff, under Rule 38 of the Federal Rules of Civil Procedure, requests a trial by jury of any issues so triable by right.

Dated: June 6, 2017

Respectfully submitted,

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